TABLE OF CONTENTS

INTRODUCTION

The Central Body Electronics (ZKE III) equipped on the X5 includes the following sub-systems under the total scope of its control:

- Windshield/tailgate wiping/washing, including windshield rain sensor (AIC).
- Interior lighting
- Central locking
- Keyless entry
- Tailgate release
- Power windows/Sunroof
- DWA alarm system
- Mirror - adjustment/memory/heating
- Seat adjustment/memory
- Steering column adjustment/memory
- Consumer cut-off/sleep mode

The following is an overview of new or changed features found on the X5 ZKE III variant.

- Passenger's door module is now incorporated into the passenger's door switchblock module.

- Sunroof module (SHD) located on the K bus.

- The Central Locking system uses a new style door lock actuator with hall effect sensors similar to E46.

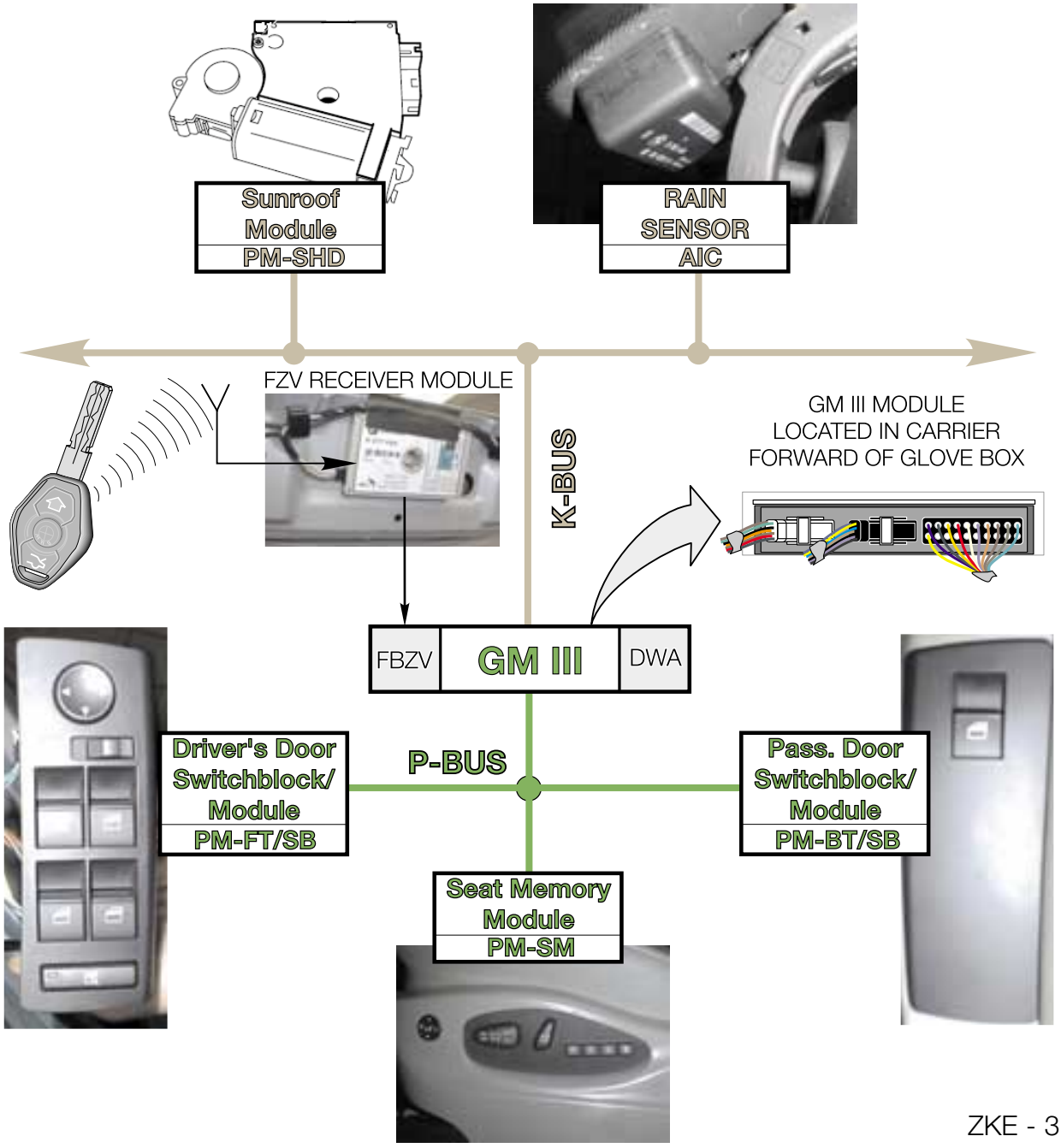
- The GM III is responsible for the Key Memory feature. It provides the added convenience of identifying users of the vehicle. Whenever the vehicle is locked or unlocked via the FZV keyless entry system, a unique key identification signal (key number) is transmitted to the General Module.

  The key identification signal alerts the GM to communicate with other control systems over the K Bus to store (when locked) or reset (when unlocked) certain driver adjustable settings for the driver using the specific key. The GM also resets certain driver adjustable settings that it controls directly.

The X5 ZKE III system continues to be a modular system consisting of the following:

- **General Module III;** main controller for ZKE functions
- **PM - FT/SB;** Driver's door switch block and door module
- **PM - BT/SB;** Passenger's door module
- **PM - SHD;** Sunroof module
- **PM - SM;** Seat/Mirror/ Steering Column memory module
- **AIC;** Rain Sensor

All of these modules communicate over the K-Bus and P-Bus for signaling purposes and diagnosis. The ZKE III continues to utilize power transistors for final stage output control.



POWER DISTRIBUTION

The X5 utilizes a single high amperage fused power distribution center located to the left EHC air reservoir beneath the cargo area floor.

The main fuse box is located inside the glove box above a hinged panel. This places the power distribution close to the main electronics carrier behind the glove box.

The glove box mounted fuse box includes fuses 1 - 64.

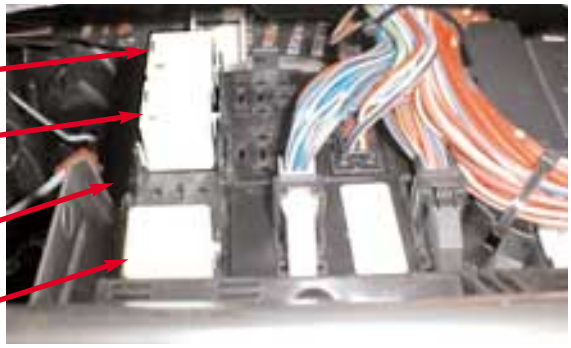
Mounted on the top surface of the fuse panel are the following relays:

FUEL PUMP

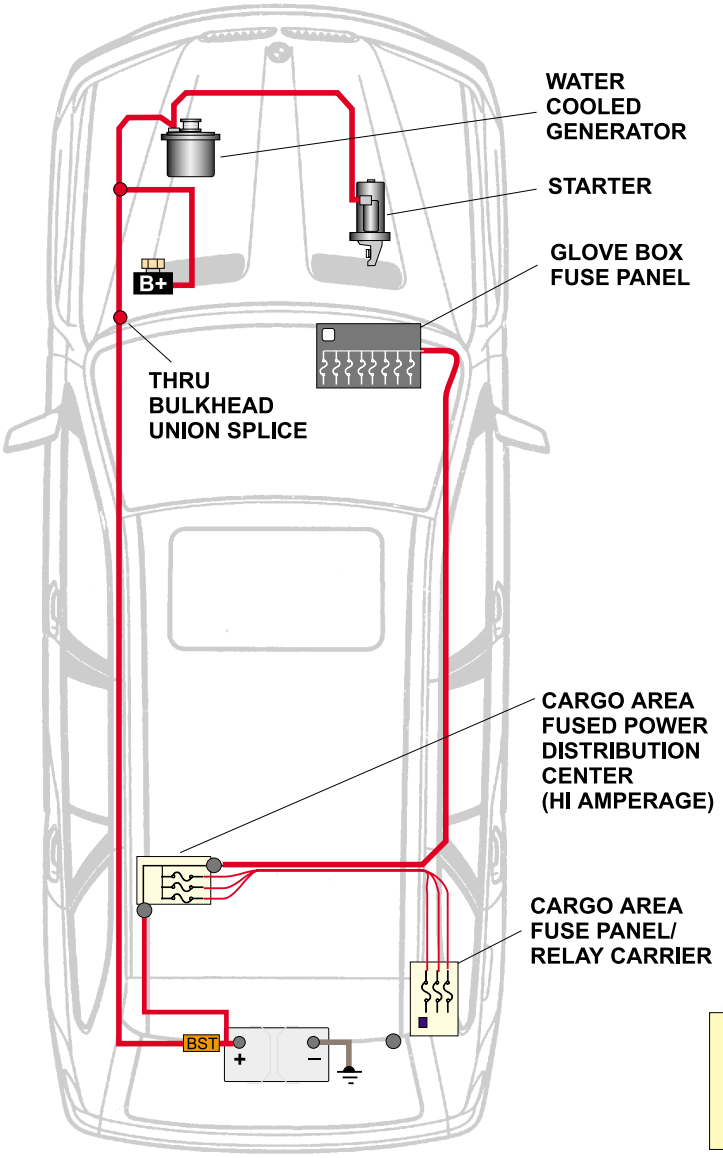
HEATED STEERING WHEEL

VISUAL ENTRY AID RELAY MODULE
(OPTIONAL - REFER TO 1999 MODEL UPDATE)
NOT SHOWN IN THIS PHOTO

HORN



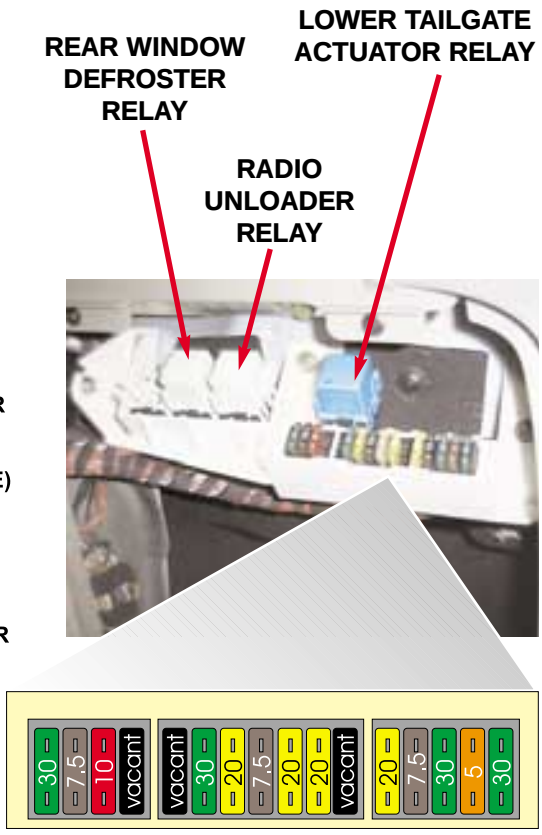
This view shown through passenger side airbag opening in dash panel.



An additional fuse panel is located in an electrical carrier located at the right rear of the cargo area.

The panel contains fuses 72 - 87.

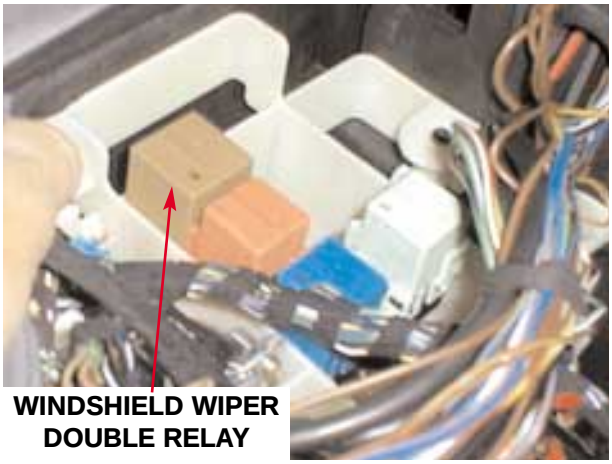
The carrier also contains the following relays



Equipment	Fuse(s)
Air suspension (EHC)	78, 87
Cargo Compartment Power Sockets	83
CD Changer	72
Central Locking in Tailgate	84
Central Locking FZV module	86
Heated Rear Window	85
Nav System	72, 73
On Board Monitor	7, 72, 73
Radio	7, 72, 73
Rear Seat Back Adjustment	77
Rear Washer Pump	81
Telephone	7, 73, 74
Trailer Socket	78

WINDSHIELD WIPING/WASHING

- The GM III controls all of the windshield wiping/washer and headlight washing functions.
- Output control of the wiper motor is through the windshield wiper double contact relay. The relay is located in the engine compartment E-box and is tan in color.
- The system continues to have four wiping stages and four interval wiping speeds. The wiping stage inputs are coded signals through a two wire link with a combination of high/low inputs as on previous systems.



WINDSHIELD WIPER DOUBLE RELAY

- The Windshield Wiping System can also be supplemented with the Rain Sensor system as optional equipment. The Rain Sensor detects rain drops on the windshield and automatically activates the wipers when the stalk switch is in the intermittent position.

Wiper Stalk Switch:

SINGLE: Holding the wiper switch down in the single position provides a ground signal to activate the slow speed circuit providing wiper operation until the switch is released.

INTERMITTENT: The intermittent wiping time inputs are provided by a potentiometer mounted in the wiper stalk switch.

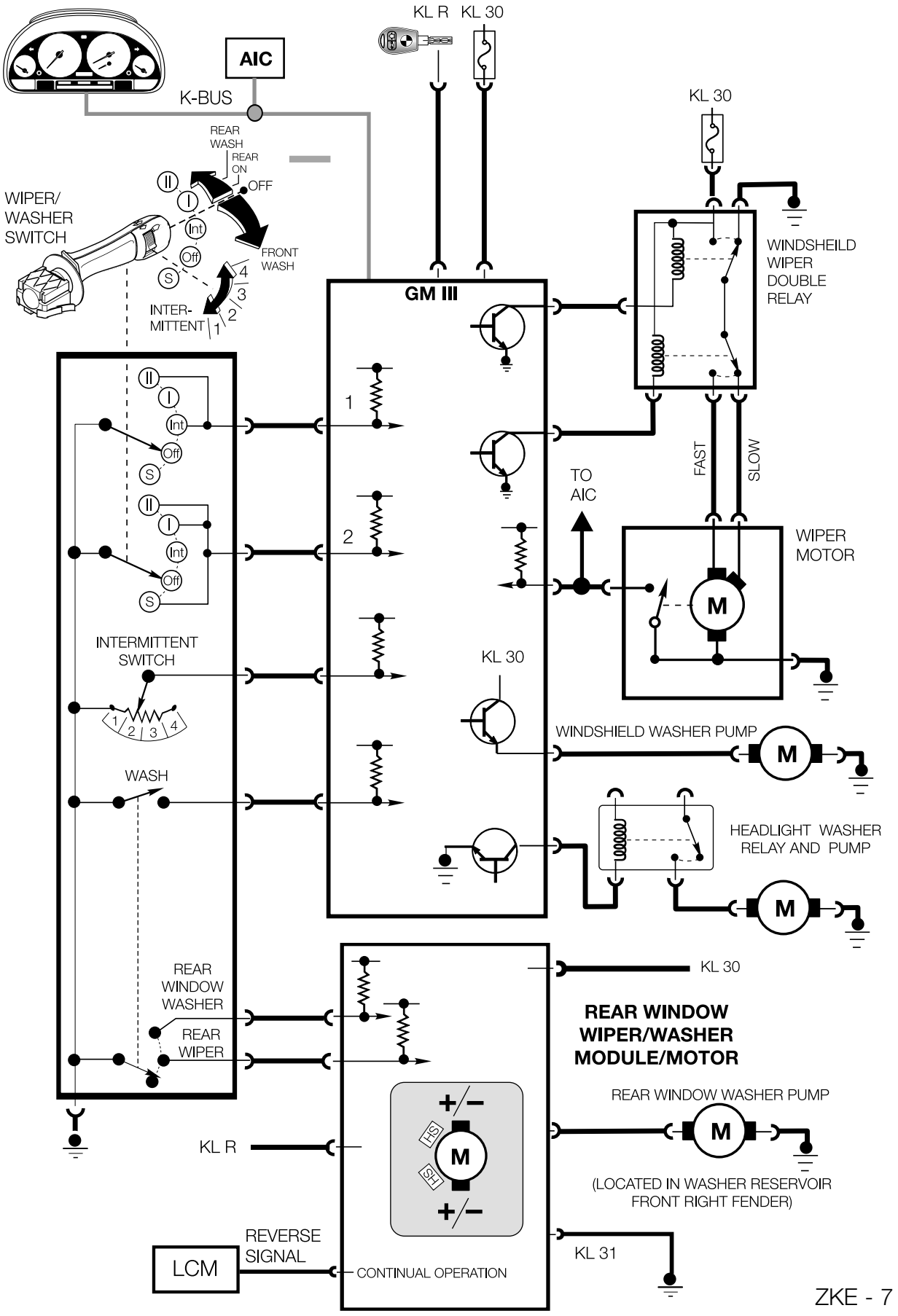
- The intermittent wiping intervals are dependent on the road speed.
- As road speed increases, the wiping interval delay is decreased.

WIPER TIME DELAYS (SECONDS) BASED ON SET POSITIONS 1 - 4

THUMB WHEEL POSITION	VEHICLE SPEED IN MPH					
	< 4	5 - 22	23 - 45	46 - 60	61 - 87	> 87
1	26	19	17	15	15	13
2	17	12	11	10	9	7
3	10	6	6	5	4	3
4	5	3	3	2	2	2

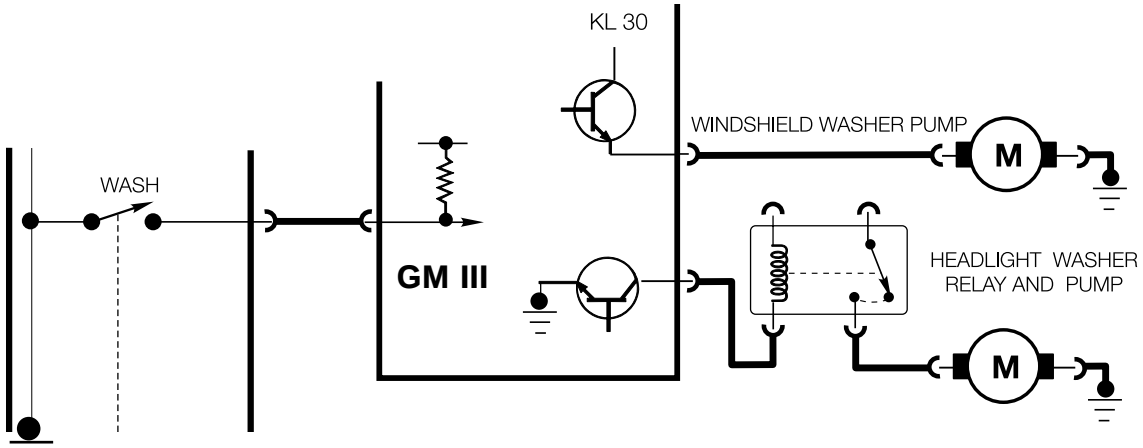
SLOW (I) AND FAST (II): The stage I and stage II wiping speeds are also affected by road speed. The factory encoded settings are the same as previous systems:

- Stage I automatically switches to intermittent when the vehicle is stopped
- Stage II switches to stage I when stopped.


KL R
KL 30
AIC
K-BUS
KL 30
REAR WASH
REAR ON
OFF
WIPER/ WASHER SWITCH
FRONT WASH
INTER-MITTENT
GM III
WINDSHEILD WIPER DOUBLE RELAY
FAST
SLOW
TO AIC
WIPER MOTOR
INTERMITTENT SWITCH
KL 30
WINDSHIELD WASHER PUMP
WASH
HEADLIGHT WASHER RELAY AND PUMP
REAR WINDOW WASHER
REAR WIPER
KL 30
REAR WINDOW WIPER/WASHER MODULE/MOTOR
REAR WINDOW WASHER PUMP
KL R
(LOCATED IN WASHER RESERVOIR FRONT RIGHT FENDER)
REVERSE SIGNAL
LCM
CONTINUAL OPERATION
KL 31

WINDSHIELD WASHING:

Pulling the Windshield Wiper Switch rearward closes the “wash” contact providing a switched ground input to the GM. The GM activates the windshield washer pump directly via a power output final stage transistor.



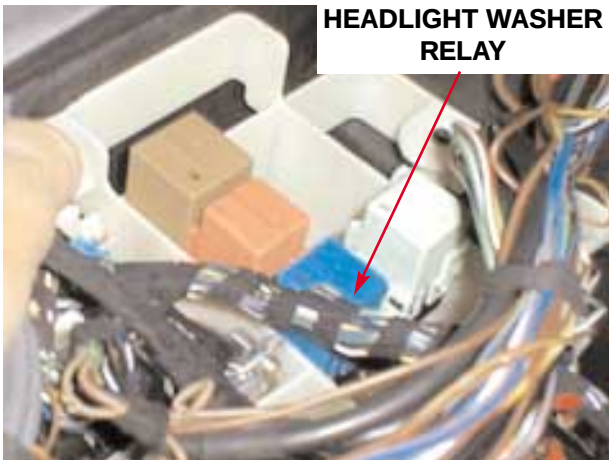
HEADLIGHT WASHING:

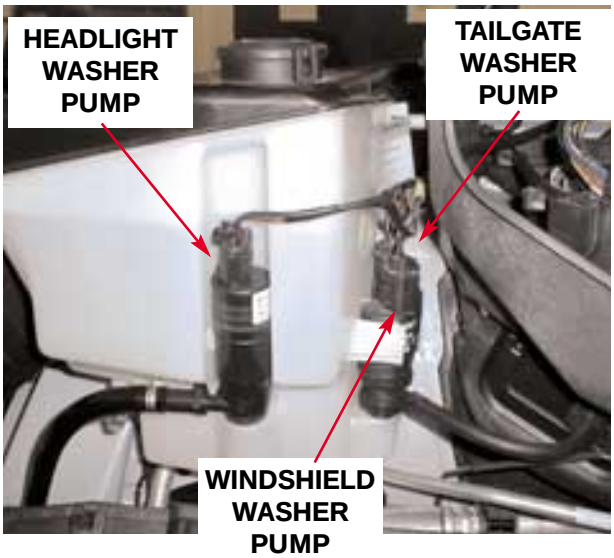
When the headlights are on, the headlight washer pump is activated with the first activation of the windshield washer pump. The GM recognizes headlights on via K bus signalling.

Within the same “on” cycle (ignition key has not been switched off), it is only activated again after five successive windshield washer cycles.

The GM provides a ground on the headlight washer relay control circuit providing pump operation. The relay is located in the e-box.

The X5 uses three separate washer pumps which are all easily accessible on the 5.3 liter washer fluid reservoir located in the engine compartment.





REAR WINDOW WIPER/WASHER SYSTEM

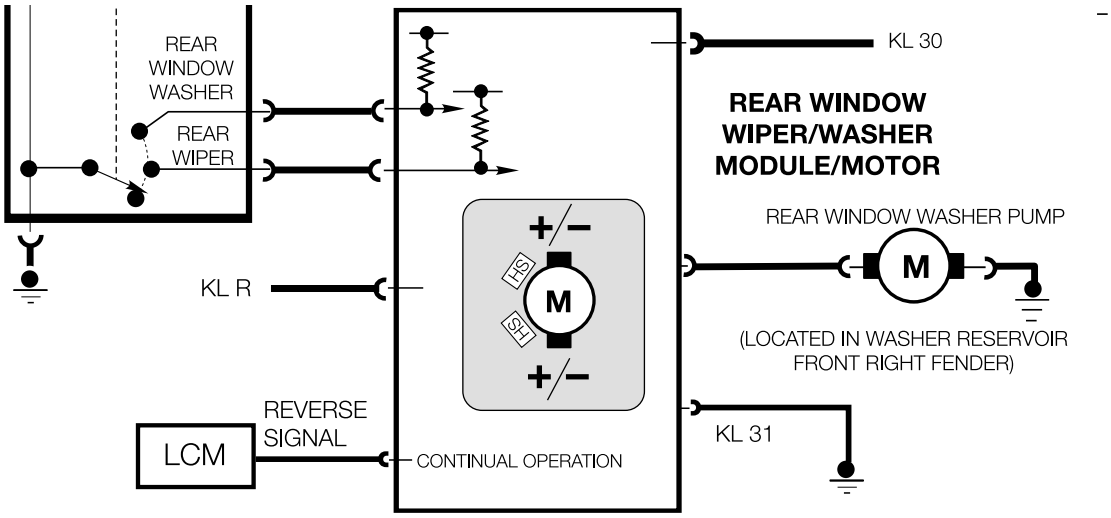
The tailgate window wiper/washer system is included in the scope of ZKE however is not controlled directly by the GM. The control electronics are integrated into the rear wiper motor assembly. It contains two hall sensors, one for monitoring park position and other for the end stop, or to signal reverse direction of the wiper motor.

The rear wiper system is operator controlled through the wiper stalk switch providing the following functions:

- Intermittent rear window wiping
- Programmed rear window wiping interval
- Operation of the rear window washer

Pressing the wiper stalk forward to the first detent activates the rear wiper in the intermittent mode.

The default timed interval is approximately 12 seconds. The full sweep and park positions are recognized by the two hall sensors on the motor gear assembly. If the wiper is switched OFF, the wiper blade will return to the park position.



The programmed wiper interval procedure is identical to the E39 sport wagon; Briefly switch the rear wiper ON/OFF, Wait the desired interval time, Switch the rear wiper ON again. The OFF time will be the programmed interval - up to approx. 30 seconds

Rear window washing is activated by pressing the wiper stalk switch to the full forward position. The washer pump operates followed by two full wiping cycles. The wipers will then switch to the intermittent wiping mode.

When the transmission is shifted into reverse, the wiper will switch to continuous operation until the vehicle is shifted out of reverse. This high signal is provided by the LCM III when it activates the back up lights.

OPTIONAL RAIN SENSOR (AIC)

The Windshield Wiping System will also be available with an optionally equipped Rain Sensor. The Rain Sensor provides added driver convenience and enhances safety by automatically activating the intermittent function of the windshield wipers when water droplets are detected on the windshield.

COMPONENTS:

The rain sensor unit is mounted on the top center area of the interior windshield surface directly behind the rear view mirror. The unit contains:

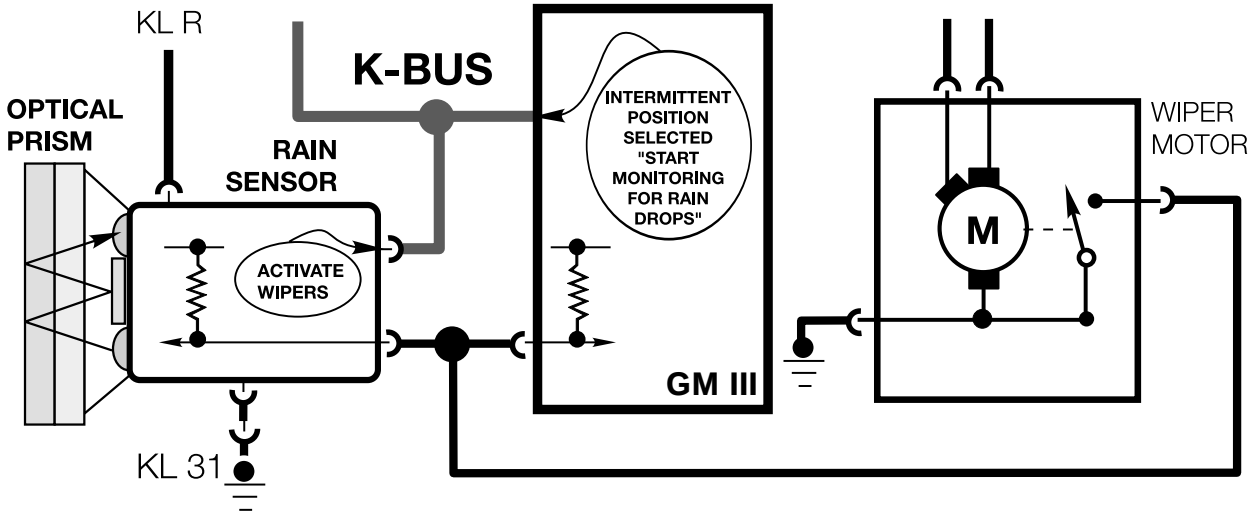
- **Optical Prism Body:** This portion of the unit is permanently fixed to the windshield. It can not be removed and can only be replaced with a replacement windshield.

  The prism body has a reflective surface that faces the back of the windshield. The prism body also acts as the windshield mount for the Rain Sensor Control Module.

- **Rain Sensor Control Module:** The control module incorporates the following;

  - Infra Red Emitter and Detector Diodes
  - Optics heater (prevents condensation from forming on diodes and prism)
  - Optics evaluation and control electronics
  - Photo cell to detect night time driving

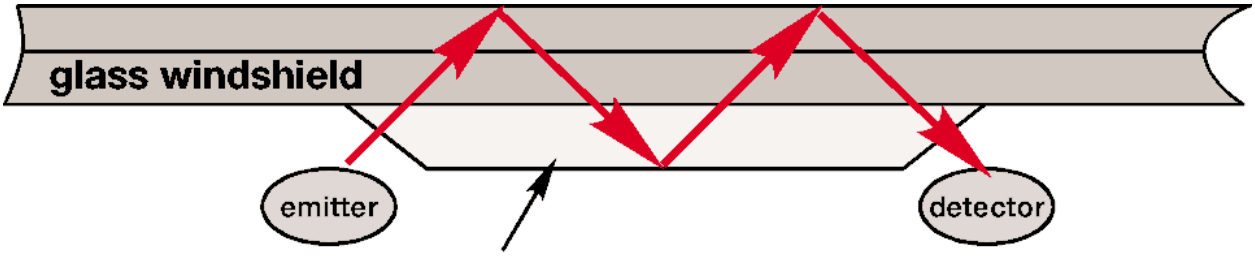
  The control module requires four signals for operation; KL R, KL 31, Windshield Wiper Motor Park Signal Feedback and K Bus interface.



THEORY OF OPERATION:

The optical infra red portion of the sensor operates by the principle of refraction (bending of a light ray). The rain sensor control module activates the emitter diode which sends a beam of infra red light through the windshield on an angle. The set angle is important because it provides the beam with a calculated reflective path back to the detector diode.

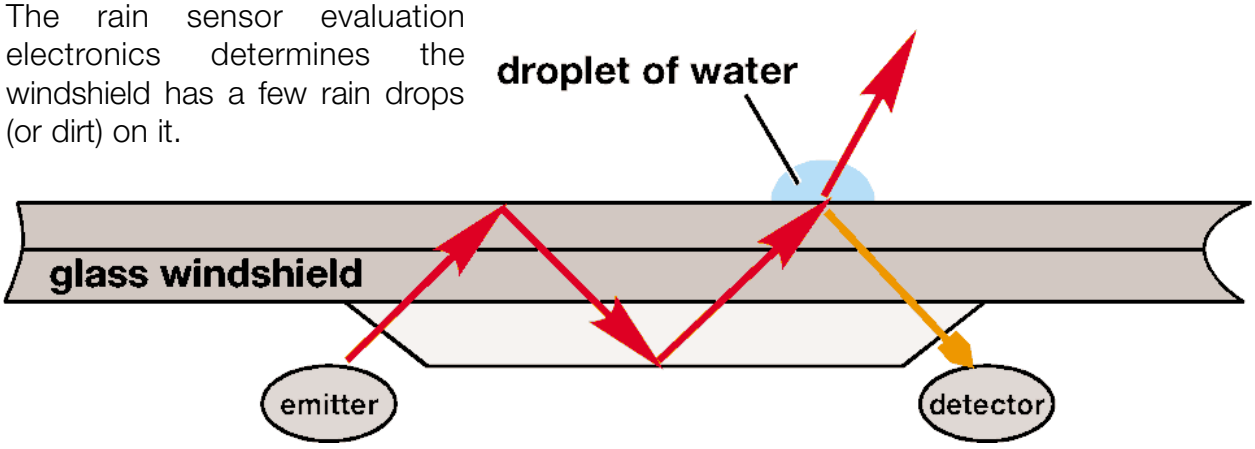
The beam is reflected back into the windshield due to the density difference of the glass compared with the ambient air on the outside surface of the glass. When the windshield is clean (no rain drops, moisture or dirt) the detector diode receives 100% of the infra red light that the was sent by the emitter. With this condition, the rain sensor evaluation electronics determines the windshield is free of rain drops.



RAIN SENSOR PRISM OPTICS

The density of water is closer to that of glass than air. When rain starts to accumulate in the sensor monitoring area, it causes part of the infra red beam to extend past the outside surface of the glass and into the rain drop. When this occurs, the beam is refracted and only part of the beam returns to the detector diode.

The rain sensor evaluation electronics determines the windshield has a few rain drops (or dirt) on it.



The intensity of the returned infra red beam diminishes proportionally with an increase of water droplets. The rain sensor control module generates a signal proportionate to the amount of rain on the windshield and broadcasts it to the GM III via the K bus.

The GM III activates the intermittent wipe cycle if the windshield wiper stalk switch is in the intermittent position. It also adjusts the frequency of wiping the windshield depending on the four position thumb wheel.

RAIN SENSOR FUNCTION:

The rain sensor is online as soon as it receives KL R operating power.

- When the windshield wiper stalk switch is placed in the intermittent position the GM signals the rain sensor control module via the K Bus of the request for intermittent wiping and the position of the knurled wheel (sensitivity).

- As an acknowledgement, the rain sensor sends a command via the K Bus to activate the wiper motor. If more than 12 seconds pass before the GM receives the acknowledgement, the GM concludes the rain sensor has a defect and operates the intermittent wipe function as a system not equipped with a rain sensor. The wiper intermittent cycling is based solely on the knurled wheel setting.

- The rain sensor continuously monitors the windshield for rain accumulation and signals the GM to activate the wipers based on the knurled wheel position and how fast the rain accumulates on the windshield.

- The knurled wheel position signal (1-4) via the K bus informs the rain sensor of the selected level of sensitivity.

  - Position 1 (least sensitive) delays the wiper activation signal.
  - Position 4 (most sensitive) sends the wiper activation signal to the GM sooner.

- When the wiper motor park contacts signal the GM of the wiper arm position, the signal is simultaneously sent to the rain sensor as an indication that the windshield has been cleared of water drops and causes the rain sensor to reset the sensitivity delay timer back to 0.

- If night time driving is detected via the integral photocell, the sensitivity to water droplets is increased causing a shorter delay than day time driving.

- Depending on the intensity of the rain the wipers will be operated continuously as if set in the normal wiper stalk switch position regardless of the knurled wheel setting. For this reason, the vehicle speed signal on the K bus is not utilized on rain sensor equipped wiper systems.

- If the ignition switch is turned off with the wiper switch in the intermittent position, the rain sensor will only become active after the ignition is switched back on and one of the following occurs:

  - The stalk switch is moved from the intermittent position and then back.
  - The knurled wheel setting is adjusted.
  - or the wash function is activated.

  The reasoning behind this switching strategy is to have the driver make a conscious decision to activate the system themselves.

RAIN SENSOR CONTROL MODULE ADAPTATION

The rain sensor control module adapts to the optics system environment as follows:

Windshield Aging: As the vehicle ages the possibility of stone chipping in the rain sensors monitoring area may occur which will cause a loss of light in the optics system.

The control module adapts for loss of light based on the intensity of the detected infra red light with a cleared windshield (wiper motor park signal). Therefore, the rain sensors function is not adversely affected due to windshield aging.

Dirty Windows: The rain sensor adaptation reacts less sensitively to a dirty windshield (dirt, road salt, wax residue) after a completed wipe cycle. A dirty windshield has a film on it that diminishes the ability of the infra red to refract into present water droplets. This causes a delay in the rain sensor detection capabilities which lengthens the time intervals on an intermittent wipe.

SERVICE NOTE FOR VEHICLES EQUIPPED WITH THE RAIN SENSOR:

Make sure the wiper blades are in perfect condition. Only use window cleaner to clean the windows. ***Dirty windows can cause the Rain Sensor control module to set a fault due to the end limits of its adaptation abilities.***

WINDSHIELD WIPER SYSTEM FAILSAFE OPERATION

The GM provides failsafe operation of the wiper system if faults are detected with any of the following input signals:

FUNCTION	FAULTED INPUT DETECTED	FAILSAFE FUNCTION
Intermittent wipe	Short or open circuit of the knurled wheel signal	Delay value for setting 3 used.
Intermittent wipe with Rain Sensor	Faulted Rain Sensor or K Bus Signal corrupt	Normal intermittent wipe implemented
Wiper motor not functional moving	Park contact feedback signal takes longer than 16 seconds	Wiper motor control deactivated for 3 minutes

WINDSHIELD WIPER SYSTEM DIAGNOSIS

The GM monitors the circuits of the wiper potentiometer, wiper motor, double relay, the windshield washer pump and terminal 30.

CENTRAL LOCKING

SYSTEM FEATURES:

- The Central Locking system controls the door locks, tailgate locks and Fuel Filler Flap actuators.

- The familiar single/double locking strategy is maintained from previous systems with a **new style door lock mechanism** combined with dual actuator motors similar to that of the E46 ZKE V system.

- The **automatic locking** feature activates the door lock actuators when a road speed signal of 7.5 MPH is detected via the K-Bus. The factory default encoding of this feature is off, but can be encoded on for individual users with the Key Memory function.

- The Driver's door lock location is the only point outside of the vehicle where the key can mechanically control the central locking system functions. The lock incorporates the familiar overrunning lock cylinder that breaks away and freewheels if an attempt is made to destroy the lock with a screwdriver, dent puller, etc.

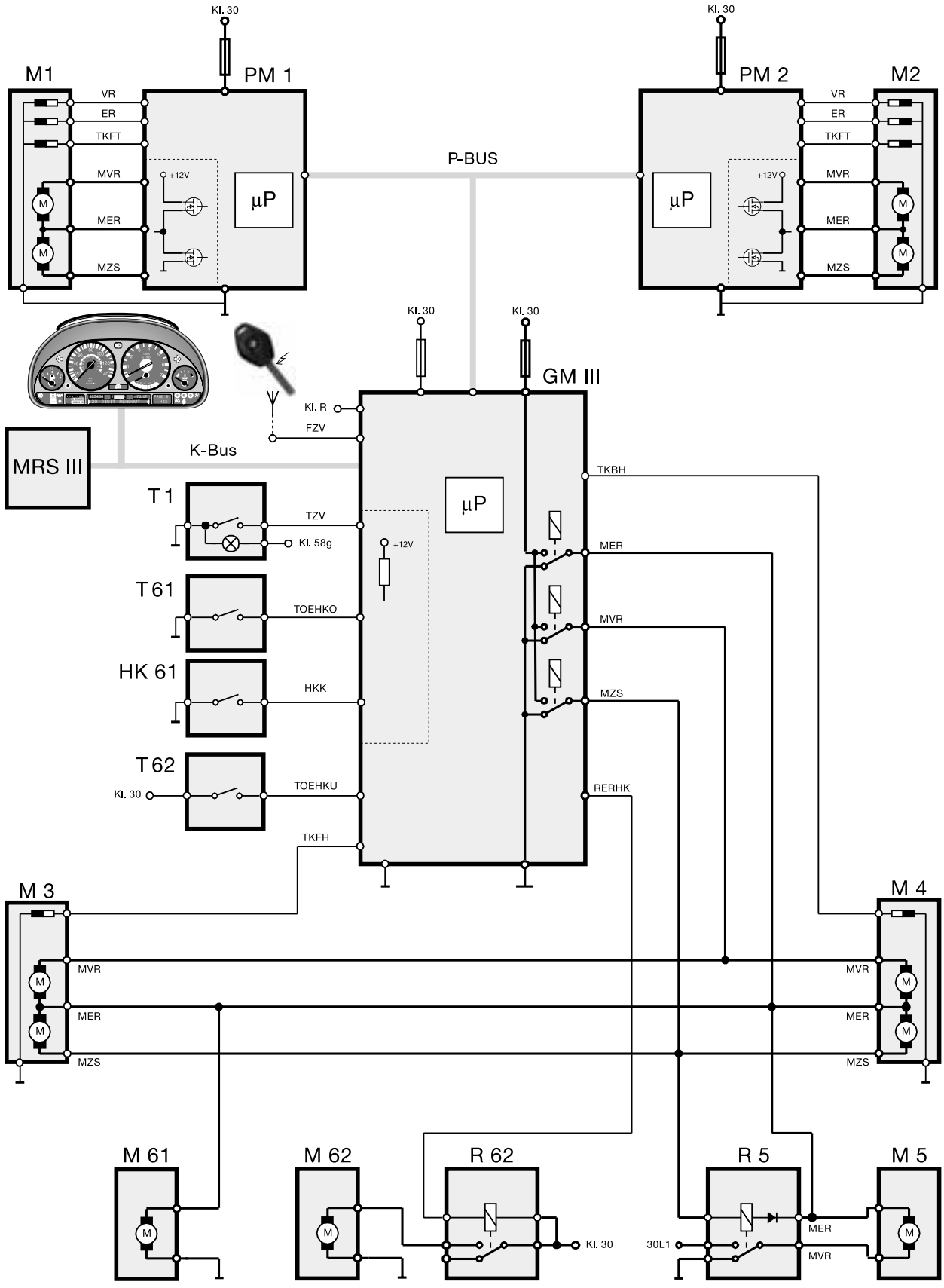
- The selective unlocking feature is maintained. A single unlock request from the driver's door with the key or via the remote transmitter unlocks the driver's door only. A second unlock request unlocks the remaining doors and trunk. This feature can be modified for individual users with the new Key Memory capabilities to activate all lock actuators simultaneously.

- When unlocked, the X5 ***upper*** tailgate can be opened by:

  - the tailgate button in the center console SZM,
  - trunk release switch pad located above the license plate, or
  - the trunk release button on an FZV key.

- With the upper tailgate open, the lower tailgate is then opened by depressing the switch located along it's top edge.

- GM and EWS 3.3 interface via the K bus to monitor double lock status and to initiate double lock override. This feature allows the doors to be opened from the inside if an accepted EWS key is switched on in the ignition when double locked.


Kl. 30
M1
PM 1
VR
ER
TKFT
MVR
MER
MZS
+12V
µP
P-BUS
PM 2
M2
Kl. 30
GM III
Kl. R
FZV
MRS III
K-Bus
T 1
TZV
Kl. 58g
T 61
TOEHKO
HK 61
HKK
T 62
Kl. 30
TOEHKU
TKFH
TKBH
MER
MVR
MZS
RERHK
M 3
M 4
M 61
M 62
R 62
R 5
M 5
30L1

DOOR LOCK ACTUATORS

The actuators are sealed, self contained units with no replaceable parts. The door lock actuators use hall effect sensors to provide:

- Door lock key position (driver's door only),
- Door open/closed status.

The driver's door lock provides the following signals to the driver's door switchblock module (PM-FT/SB):

- Lock / Unlock,
- DWA arm/disarm
- Convenience closing and opening signals.

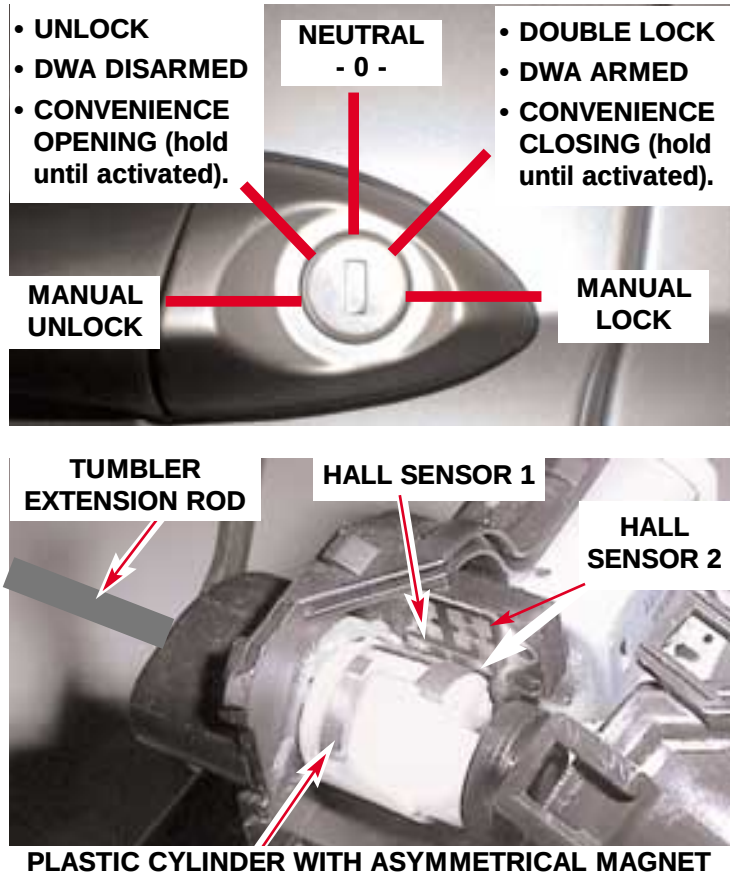
DOOR LOCK POSITION HALL SENSORS

The Drivers door switchblock module monitors these key positions over two wires. The signals are generated by two hall effect sensors (Hall Sensor 1 & 2) located in the actuator.

When the key is turned, a plastic cylinder in the lock actuator is simultaneously rotated by the lock tumbler extension rod.

A magnet is incorporated in the plastic cylinder, which when rotated changes the magnetic influence on the hall sensors.

The presence of a magnet in close proximity to the sensing surface of either hall sensor creates a coded input over the two wires that the GM uses to determine the key position.



PLASTIC CYLINDER WITH ASYMMETRICAL MAGNET
(Shown in the Lock Position)

- Magnet in front of sensor, current flow through the sensor is <5 mA **(0)**.
- Magnet rotated away from sensor, current flow through the sensor is >12 mA **(1)**.

Hall sensor 1 & 2 are not included in the front passenger door or rear door actuators.

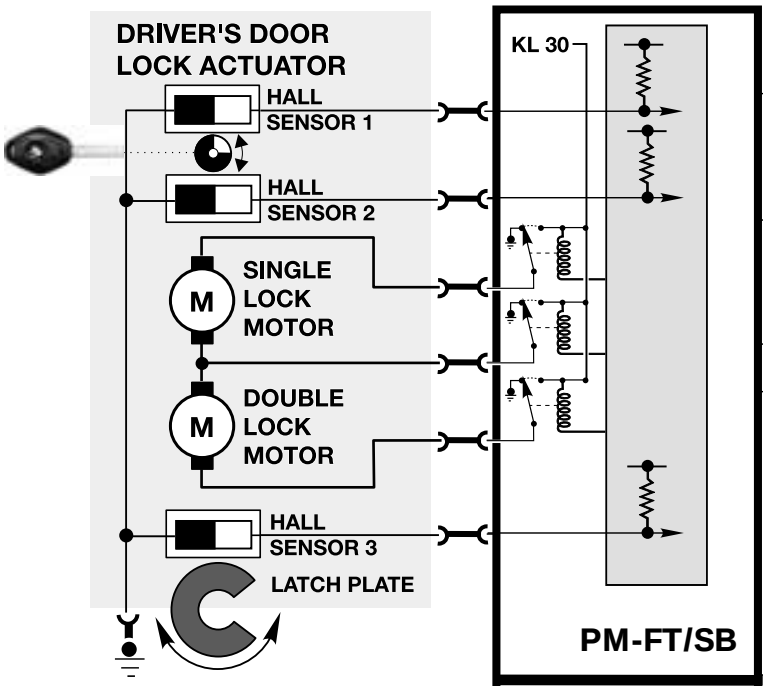
DOOR CONTACT HALL SENSOR

Also included in the driver's door actuator is a third hall effect sensor. This sensor signals the door open/closed status to the driver's door switch block module and to the GM via the P-bus.

The rotary latch plate position activates the door contact hall sensor.

- When the door latch is closed, current flow through the sensor is <5 mA **(0)**.
- When the door is open, current flow through the sensor is >12 mA **(1)**.

The passenger side front door and both rear door lock actuators only include this hall effect sensor (hall sensor 3). Hall sensors 1 & 2 are not required.



ACTUATOR MOTOR CONTROL

There are two motors incorporated in each actuator that provide two separate functions:

- **Single lock/unlock function**. This motor controls the mechanical lock mechanism when the central lock button is pressed to single lock the vehicle. The mechanism is locked at this point but can by opened from the interior by pulling an interior door handle **twice** or by pressing the central lock button again. When single lock function is activated, the fuel filler flap actuator is not locked.

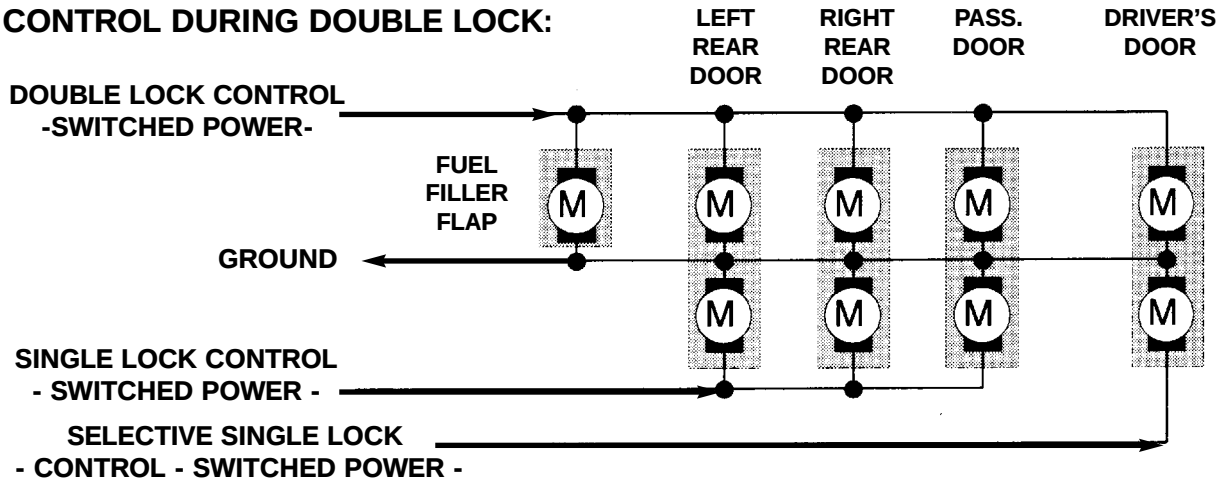
- **Double lock/unlock function**. This motor is activated only when the vehicle is locked from the outside at the driver's door lock with a key or when the GM receives a lock request from the FZV system. In this case the double lock motor is activated simultaneously with the single lock motor. The function of the double lock motor is to mechanically offset an internal rod disabling it from unlocking the vehicle from the interior. This prevents the doors from being unlocked by any means except from an unlock request at the driver's door, the FZV remote key or via central lock button.

- Continuous locking/unlocking will initiate a timed arrest of the locking system. The GM counts each time the locks are actuated. After approximately 12 cycles, the timed arrest is active. The timed arrest is deactivated one actuator cycle for every 8 seconds until the counter is reset to 0. The timed arrest is overridden if a crash signal is received from the MRS III.

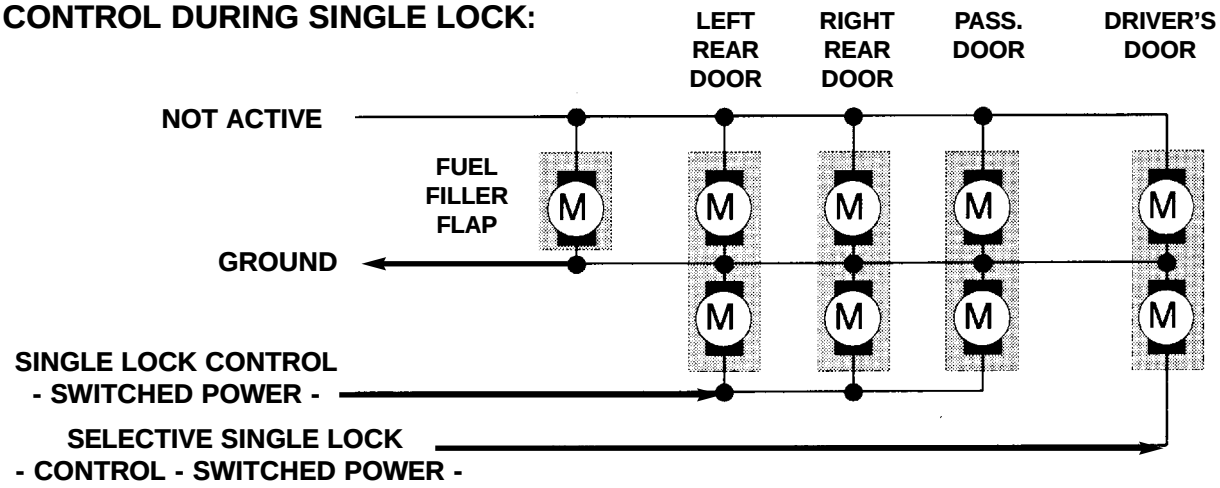
All door lock actuators and the fuel filler flap actuator are controlled directly by the GM via four internal load relays. The drivers door lock actuator has a separate circuit for the selective unlocking feature.

If this feature is disabled by key memory encoding, the driver's door lock actuator selective unlock circuit is activated simultaneously with the balance of the motors during unlock.

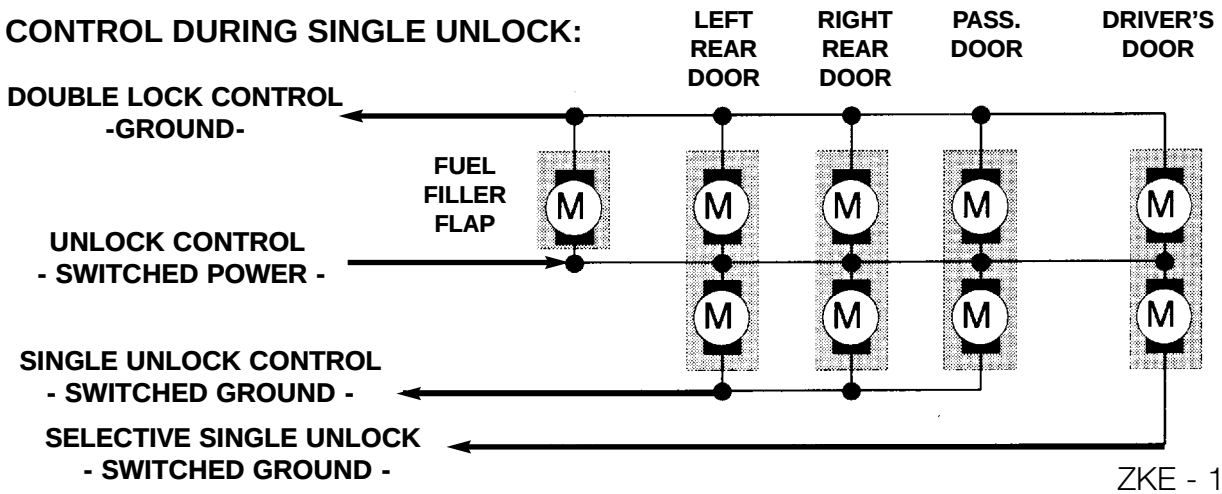
CONTROL DURING DOUBLE LOCK:



CONTROL DURING SINGLE LOCK:



CONTROL DURING SINGLE UNLOCK:

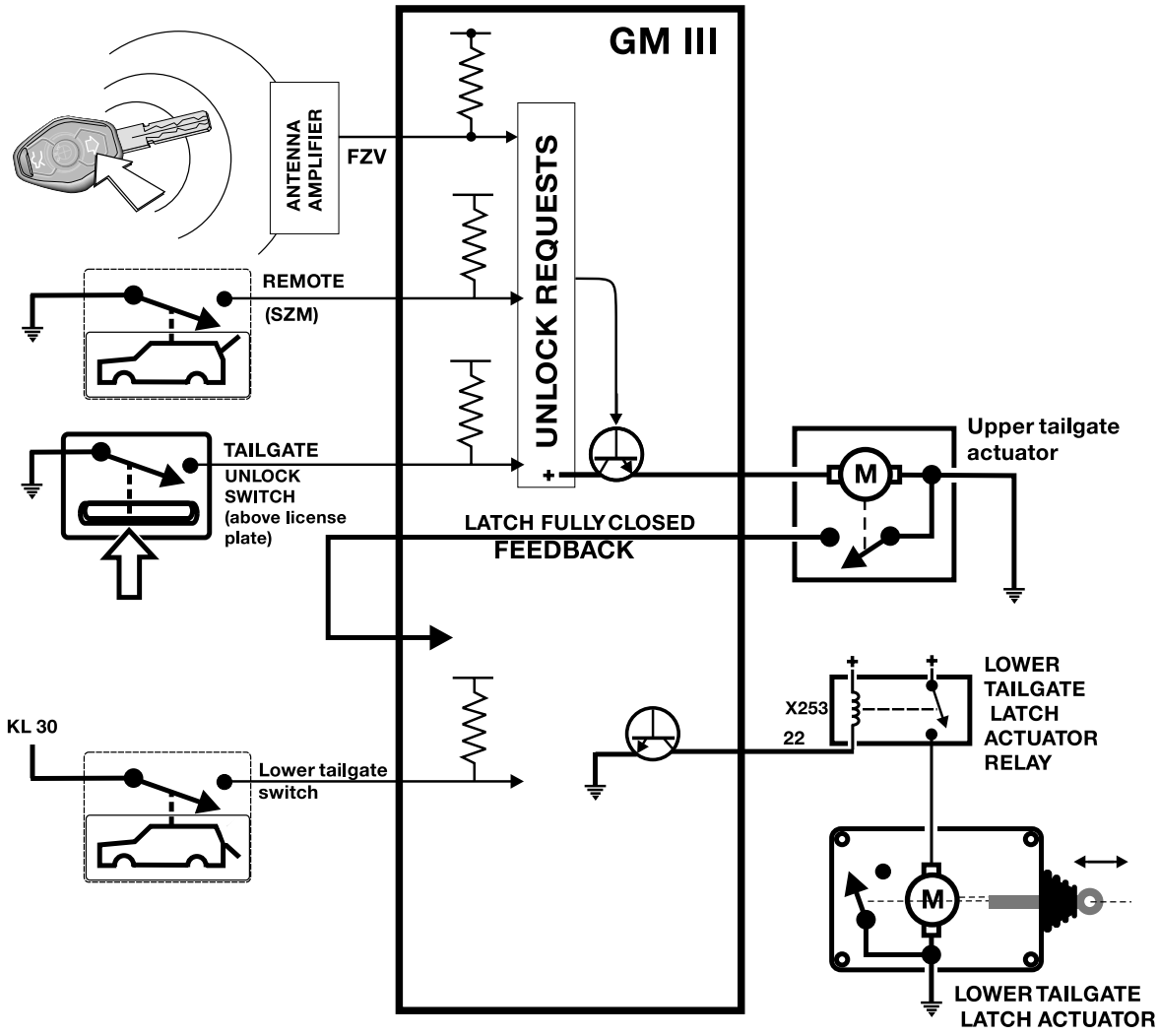


TAILGATE CONTROL

The tailgate can be opened from the following locations:

- Exterior tailgate switch pad above the license plate
- Interior remote tailgate button
- FZV radio key

The remote tailgate button is locked out when the GM detects a vehicle speed signal > 4 MPH via the K-bus. The switch has been incorporated into the SZM.



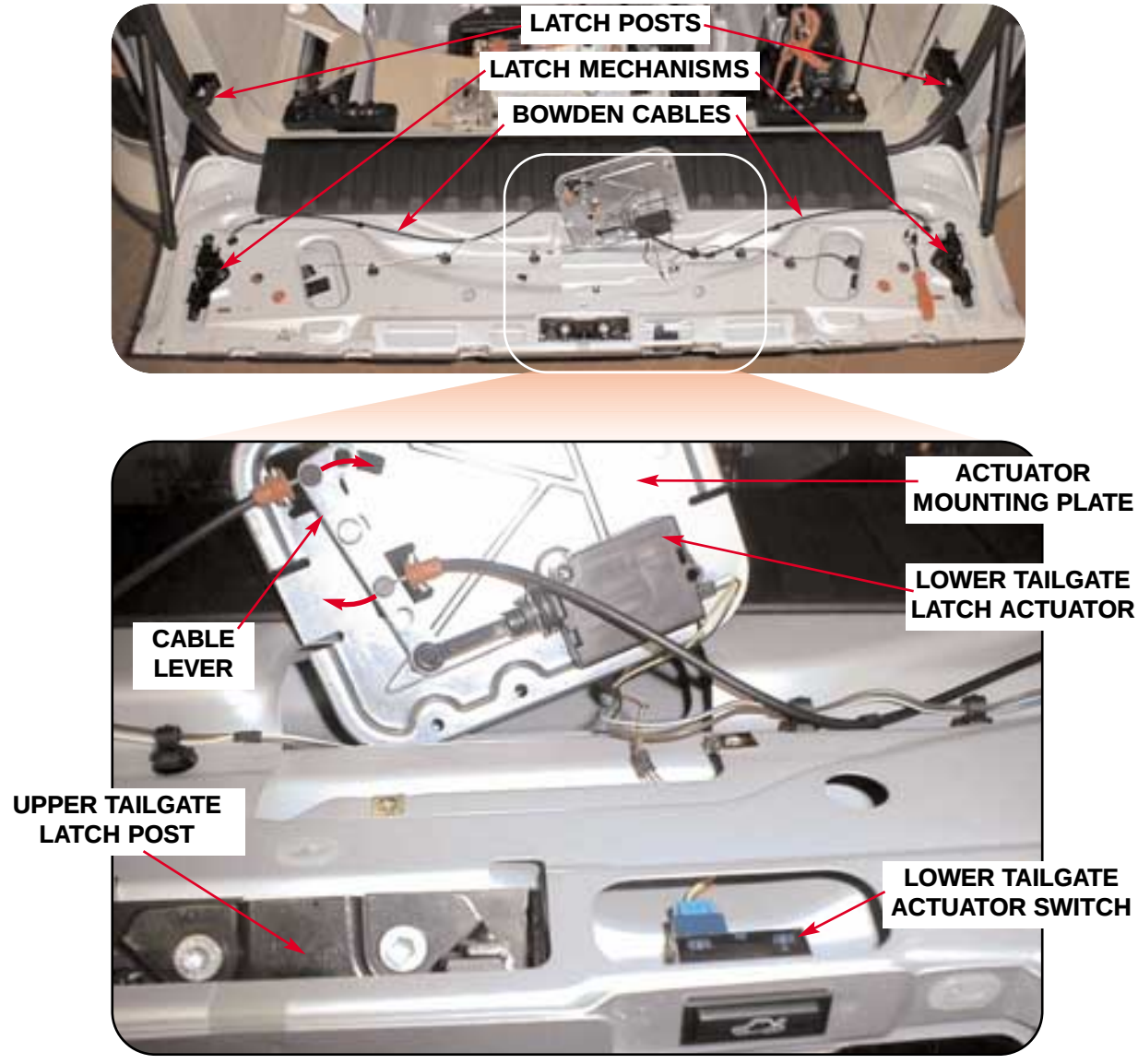
TAILGATE LOCK ACTUATORS

Each tailgate has a separate latching/actuator system. The upper tailgate actuator must first be activated open before the lower tailgate actuator can be operated (program logic).

When closed, the tailgate actuator position switch provides a ground signal to the GM signifying a "closed tailgate". This switch also serves as the tailgate open signal to automatically switch the interior lights on.

The lower tailgate actuator operates a lever which pulls two bowden cables to unlatch the outboard mounted latch mechanisms. The upper and lower latch mechanisms can also be manually unlatched for if electrical malfunction occurs (refer to complete vehicle section).

LOWER TAILGATE COMPONENTS



CENTRAL LOCKING BUTTON

The central lock button in the center console provides a momentary ground input signal to the GM.

- This input initiates a single lock for each door and the trunk.
- The fuel filler flap remains unlocked for refueling purposes.
- If a door is manually opened while centrally locked, the remaining doors stay locked.

The opened door can be re-locked when closed by manually locking or pushing the central button twice. This allows the locks of the remaining doors to be re-synchronized again.

As an additional safety feature, the central lock button input also unlocks a double locked system. Pressing the button returns the system to central lock (single) position, allowing the doors to be opened when the interior door handles are opened twice. This feature was also added to other ZKE systems during the 1999 model year.

CRASH SIGNALLING

The Multiple Restraint System (MRS III) provides a switched signal to the GM in the event of an accident. The signal is an output function of the MRS control module and becomes active when MRS determines a crash has occurred.

When active, the GM unlocks the door lock actuators, switches on the interior lights and signals the LCM III via the K bus to activate the hazard warning flashers.

Once the crash signal is active, the GM will not respond to lock requests from the system until the ignition switch is cycled or a front door is opened.

REMOTE RF (KEYLESS) ENTRY

The X5 keyless entry system's operation is carried over from the E38/E39. However, the FZV key has undergone considerable redesign.

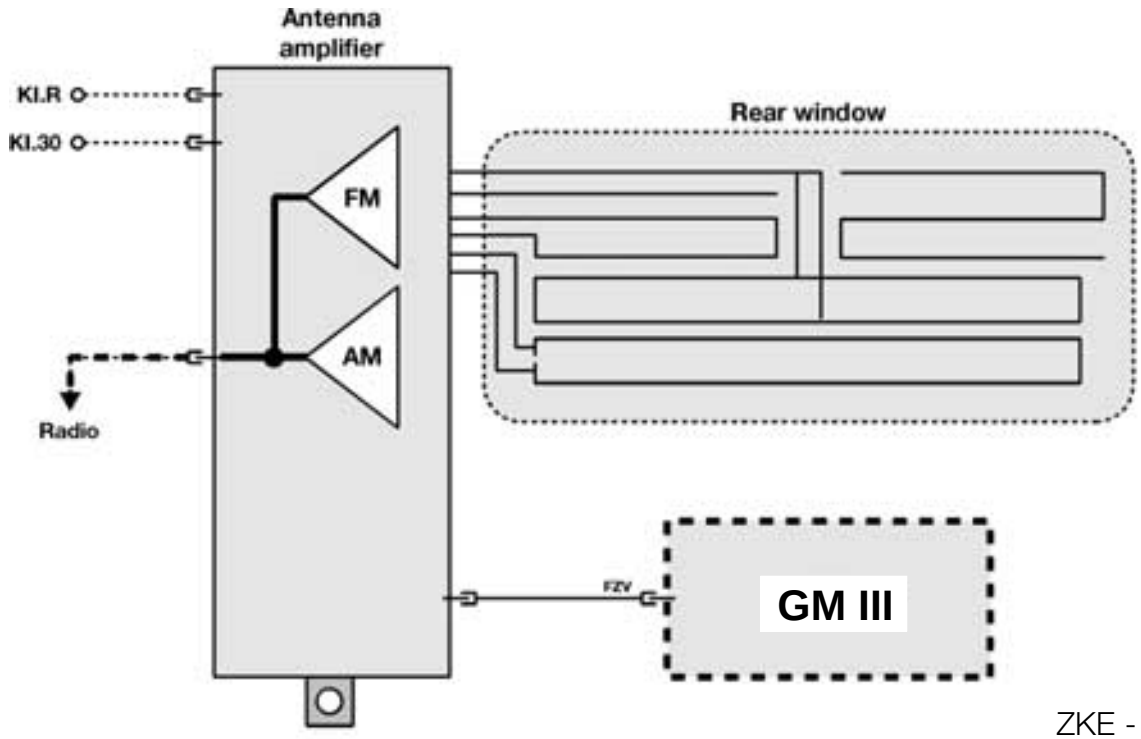
- The remote key receiver is part of the antenna amplifier and is installed in the center of the top section of the tailgate.

  The receiver produces a digital signal based on the transmitter command and sends it to the GM for processing.

  The GM then carries out all remote lock system, window/sunroof convenience closing features and DWA arming/disarming functions.

- The frequency at which the key transmits the radio signal to the antenna amplifier is 315 MHz.

- The system is also used to convey the key identification number being used to lock/unlock the vehicle. This is a requirement of the Key Memory feature covered further on in this manual.



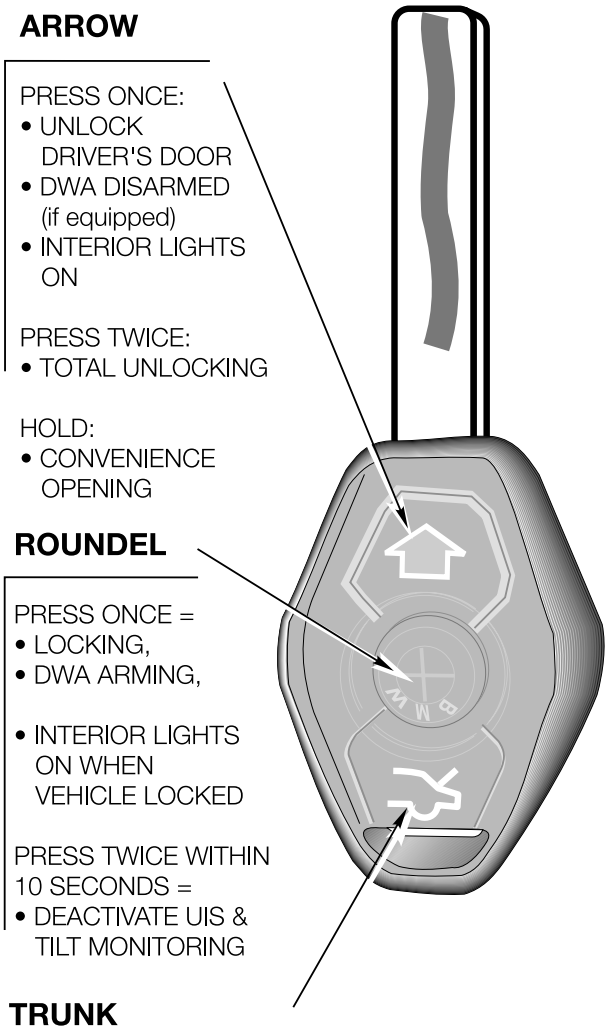
MODEL YEAR 2000 FZV KEY

Visual Changes:

- New appearance with blue and white BMW roundel.
- New button arrangement (larger buttons) with sequential operation (enhanced operating convenience)
- Rechargeable battery replaces replaceable batteries. Charged by EWS ring antenna.
- The key housing is encapsulated and can not be opened.
- The LED has been omitted.
- Key will be used in E46, E38 and E39 vehicles.

Features of the keyless entry system include:

- Up to 4 radio-control keys can be operated in conjunction with one vehicle.
- Locking/unlocking of doors, tailgate, fuel filler lid.
- Selective unlocking of driver's door (as with key in lock)
- Arming/dis-arming of DWA alarm system (if equipped).
- Remote unlocking of the tailgate only.
- Comfort opening of windows and sunroof
- Interior lighting activation (search mode).
- Panic mode alarm activation..
- Automatic correction for up to 1000 erroneous activation signals.
- Low transmitter battery fault code storage in the GM.
- An EEPROM is used to store the key data.
- Keys delivered with a four color label sheet containing four different colored labels for each of the four possible FZV keys.



REMOTE KEY INITIALIZATION

The initialization of the FZV keys is required to establish the Lock/Unlock signal synchronization with the GM. The initialization procedure provides the GM with a key identification number and a “rolling code” for each key. If the initialization is not performed, the GM will not respond to the key signals.

Up to 4 remote keys can be initialized. They must be initialized at the same time. Key initialization is only possible with the vehicle unlocked.

Procedure:

1. Close all doors and have all keys available.

2. Using key number 1, turn the ignition switch to KL R, then switch off within 5 seconds and remove the first key.

3. Within 30 seconds of turning the ignition switch to “off” **Press and hold** the **arrow** button.

4. While holding the arrow button, **press and release** (*“tap”)* **the roundel** button **three times** within 10 seconds.

5. Release both buttons. The GM will immediately lock and unlock the doors signaling a successful initialization.

6. If additional keys need to be initialized repeat steps 3 - 5 within 30 seconds.

7. Switching the ignition to KL R completes the initialization.

SERVICE NOTE: The key memory function of the GM responds to the key identification number of each key. If the keys are not initialized in the same order prior to initialization, the key memory function activated by the keys will not be assigned correctly.

Always initialize the keys in the same order.

FZV KEY RECHARGEABLE BATTERY

From KL R, the battery inside the key head is charged inductively by the EWS ring antenna via a coil antenna integrated in the key. The charging process is controlled by electronic circuitry integrated in the key.

- The service life of a radio-control key used under normal conditions corresponds to the vehicle lifespan.

- If the FZV keys are not used (ie: stored in a drawer), the battery will be discharged after approx. 1.5 years.

- The time required to fully charge a discharged battery is approx. 30 hours.

- The remote control can be operated about 15 times after a charging period of approx. 30 minutes (driving time).

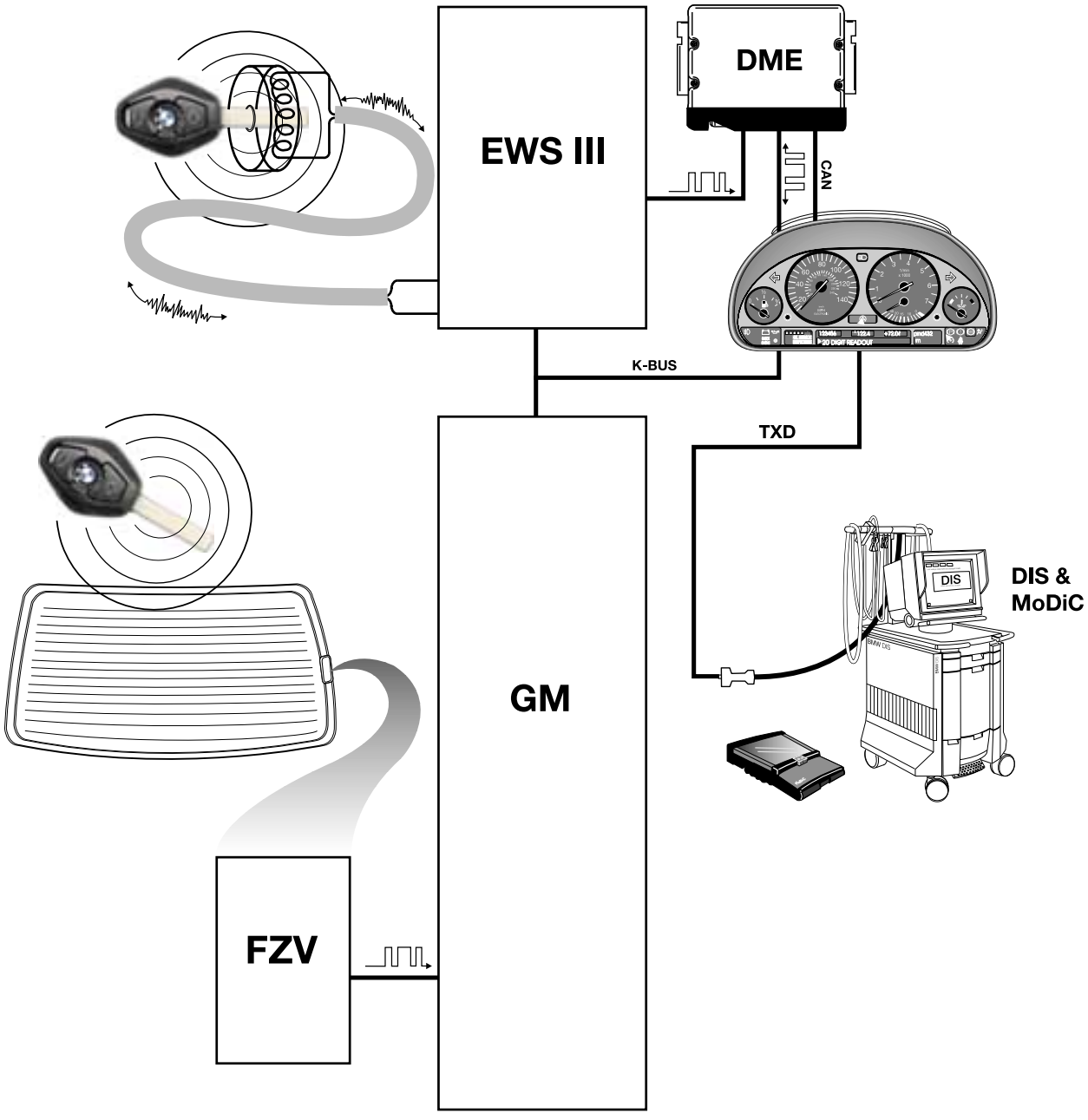
The key data is stored in a transponder chip. The transponder chip is a wireless read and write EEPROM. It is powered via the ring coil at the steering lock. Power is applied electromagnetically when the key is in the ignition switch from KL R.

The power supply is used both for data transfer as well as for charging the battery. This has been made possible by new development of the transponder chip.

As with previous systems, every press of an FZV key also provides the battery charge condition. When the FZV electronics receives a low power condition message three successive times, the GM sets a fault indicating a low battery within a specific key. The LCM is also informed via the bus system and alerts the driver via an instrument cluster matrix message.

If the battery is recharged (used operate car), the fault will be automatically deleted when five successive messages are received indicating a charged battery condition.

The battery has no affect on the EWS III communication function!


EWS III
DME
CAN
K-BUS
TXD
GM
FZV
DIS &
MoDiC

Car Memory / Key Memory

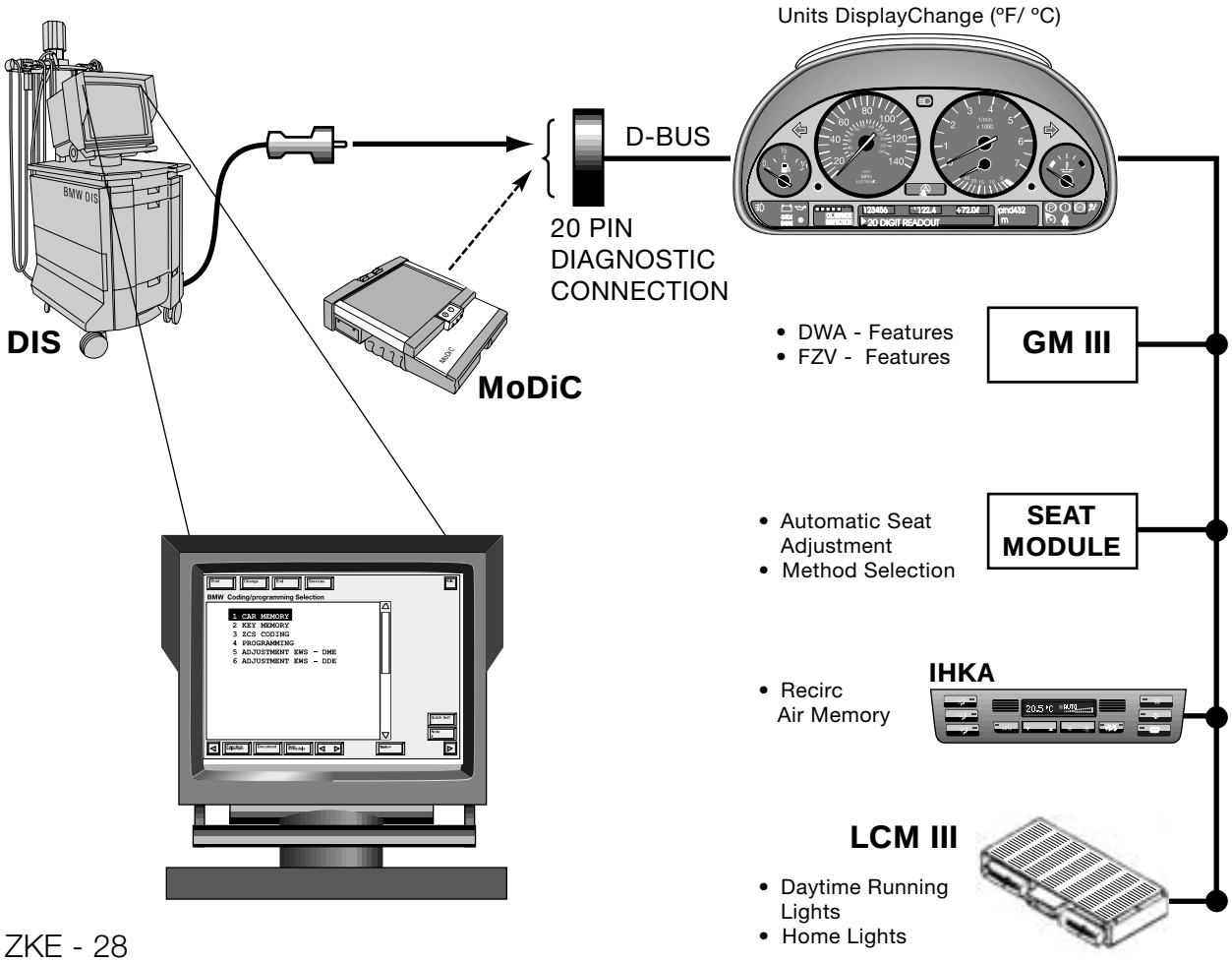
The Car/Key Memory feature provides the flexibility of allowing the owner to customize certain functions of select vehicle systems and automatically identifies users of the vehicle by a key identification signal provided by the remote keyless entry system (FZV).

Car & Key memory is marketed as a combined feature but is actually two separate functions of the select vehicle control systems.

Car Memory: The owner is provided with a list of available system functions that can be customized to their liking. Prior to delivery, the DIS or MoDiC is used to encode the owner's chosen selections into the appropriate control modules.

These choices become a permanent function of the control module and can only be changed by re-encoding with the DIS or MoDiC at a BMW Center.

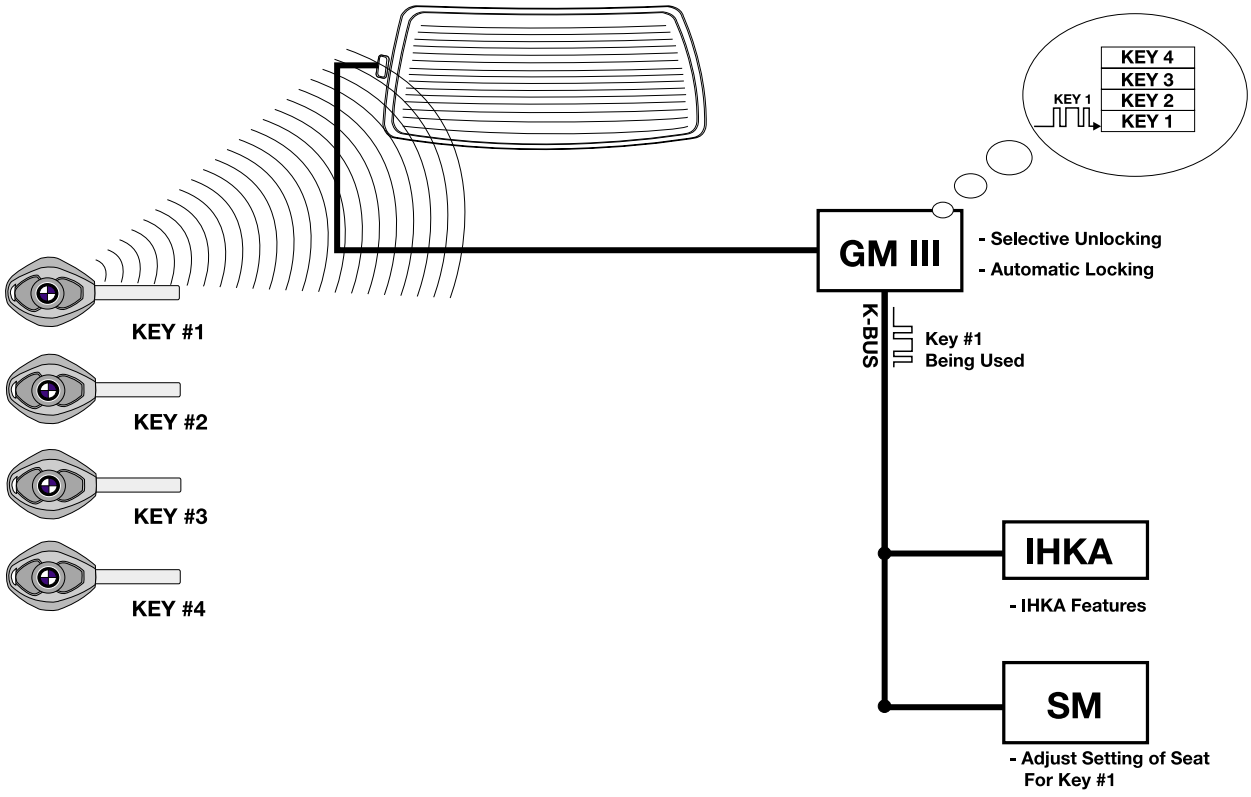
This feature has been available for some time via the ZCS Conversion Feature but has never been fully utilized or officially presented to the vehicle owner as a feature of their vehicle.



Key Memory: This feature provides the added convenience of identifying users of the vehicle whenever a lock or unlocked signal is generated via the individual FZV keys. A maximum of four FZV keys can be used with the Key Memory feature.

Each of the four keys generate a unique key identification signal (key number) that is transmitted simultaneously with the lock/unlock signals to the General Module. ***Key Memory does not respond to Lock/Unlock requests from the drivers door lock.***

Most of the key memory functions require the vehicle be configured using the "KEY MEMORY" function of the DIS or MoDiC. However, there are a few features that store settings automatically without configuration such as IHKA blower speed and temp setting.



The key ID signal alerts the GM V to communicate with select control systems over the K Bus to store (when locked) or reset (when unlocked) certain driver adjustable settings.

There are features that function as both a Car & Key Memory feature.

Example; the Automatic Seat Adjustment feature is encoded as a Car Memory Function with the following possibilities:

- when unlocking,
- when opening a door after unlocking
- or not active at all.

If active, the seat positions are stored and reactivated by the Key Memory function for individual users of the car.

REQUIRED PRECONDITIONS:

Before configuring Car or Key Memory Functions, connect a battery charger to the vehicle. This will ensure adequate battery voltage during the Car/Key Memory configuration.

If battery voltage drops below 11.8 volts, the procedure will terminate.

Car Memory Configuration procedure:

From the Coding/Programming Selection function of the DIS or MoDiC, Select "CAR MEMORY" and proceed by pressing the right arrow.

The system will scan for control systems capable of configuration based on the ZCS in the Instrument Cluster.

After a short wait the system will display a list of detected control systems capable of CAR MEMORY configuration.

Using the owner's selection list, enter the systems selected for customization.

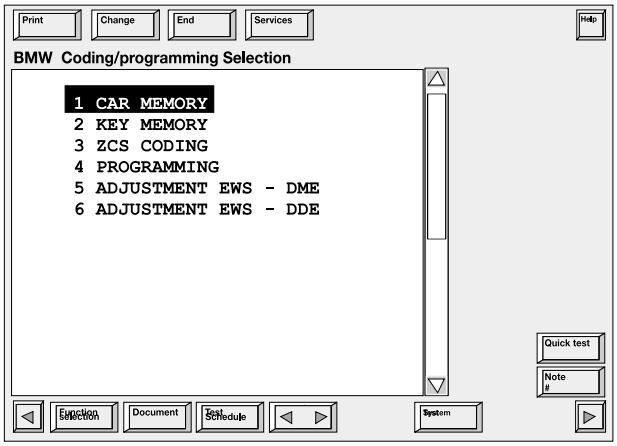
Example: The owner chooses not to have an acoustic acknowledgment when the DWA is disarmed.

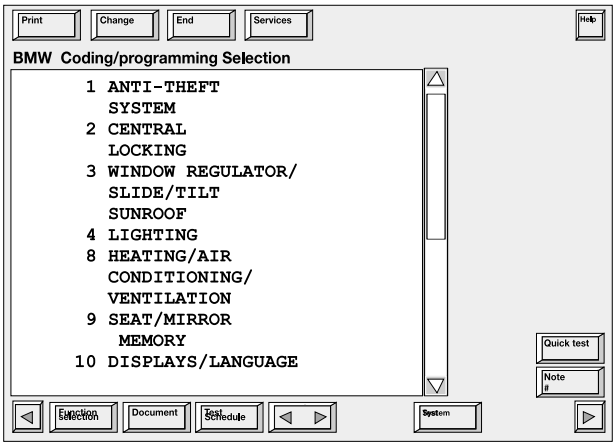
- From the displayed list select "Anti Theft System" and press the continue arrow.

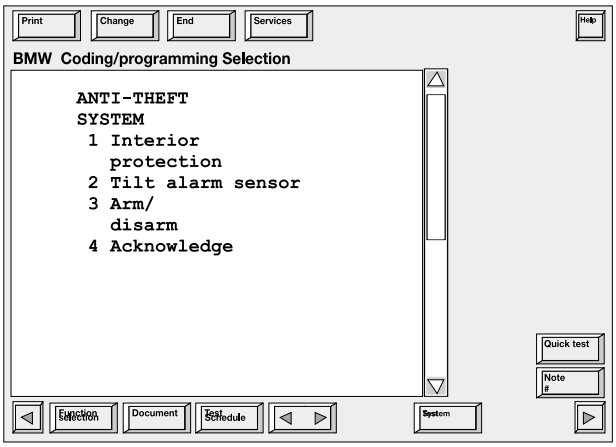
- From the Anti Theft Sub menu, select 4. Acknowledge.

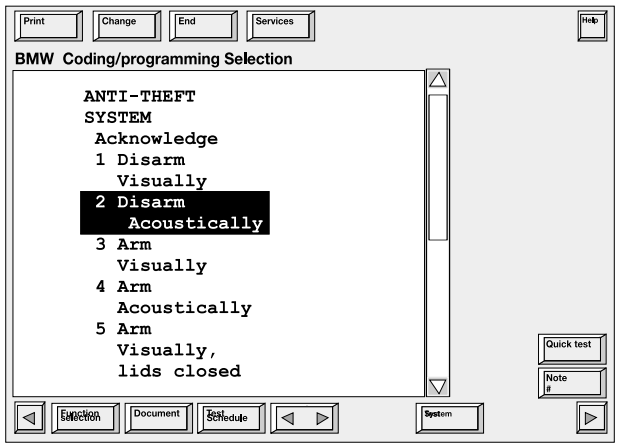
The Acknowledge sub menu provides all possible options for the DWA Acknowledgment.

- Select 2. Disarm Acoustically, and press the continue arrow.









The next displayed screen is the "active/not active" selection.

The blue "=" sign indicates what mode this particular function is set to at the present.

- Select the "not active" function and press the continue arrow.

The system will accept the selection and bring the CAR MEMORY main selection menu back in the display.

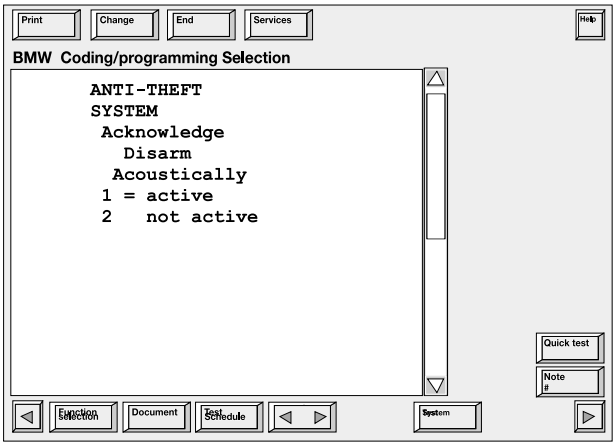
If additional selections are required, enter into the systems displayed and repeat the steps from above.

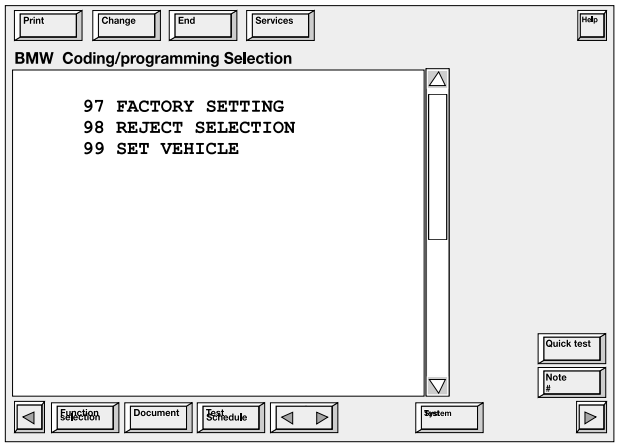
- When all of the required CAR MEMORY configuration selections are entered, scroll down to the bottom of the main car memory menu and select 99 SET VEHICLE.

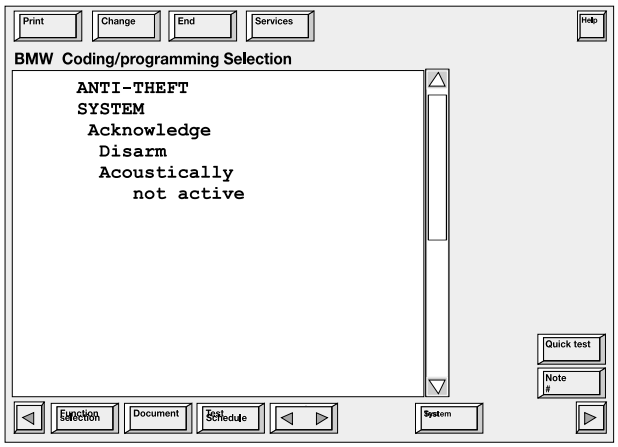
All of the selected configuration changes are now displayed. Check the displayed list against the Owner's selection list making sure all of the choices are entered.

Print this list out and place in the vehicle history file for future reference.

- Press the continue arrow to proceed with the configuration. The display will request that the ignition switch be "switched off and on again". Switch off for a minimum of 10 seconds, then switch back on. Press the "Yes" button to continue.





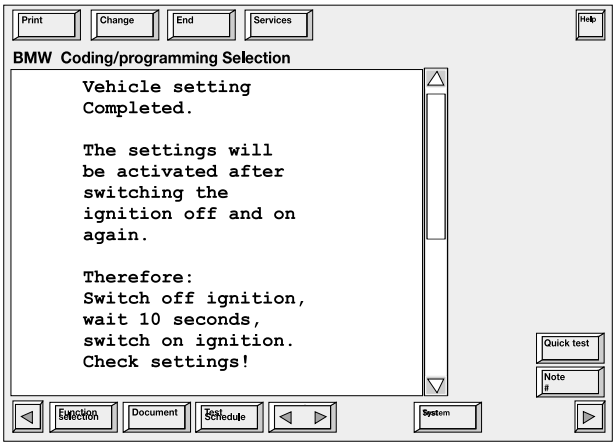


A bar graph indicating configuration progress is displayed along with the current battery voltage. This portion of the configuration varies in duration based on the total number of configuration selections. Watch the battery voltage level during the configuration. Low battery condition will terminate or possibly incorrectly configure the vehicle.

The display will change indicating the “Vehicle setting completed”. Switch ignition off for 10 seconds and then back on.

Verify the configuration change(s) by activating the new function.

Pressing the Left arrow brings the Main Coding/Programming Menu back in the display.

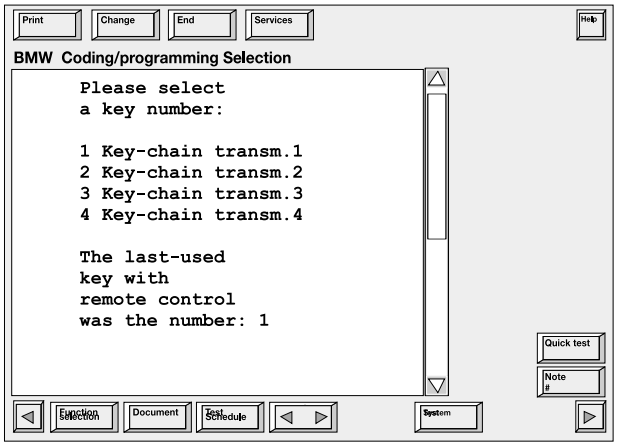


Key Memory Configuration procedure:

From the Coding/Programming Selection function of the DIS or MoDiC, Select "KEY MEMORY" and proceed by pressing the right arrow.

With the ignition switched on press the right arrow to allow the system to scan for control systems capable of KEY MEMORY configuration.

After a short wait the system will display a key number selection list of the four possible keys. The display also indicates the identification number of the last key used

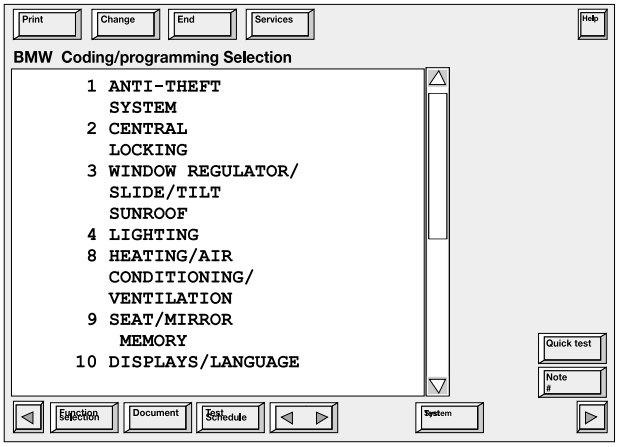


- Using the owner's selection list, select the key for key memory assignment and press the continue arrow.

The system will scan for key memory functions for the specific key.

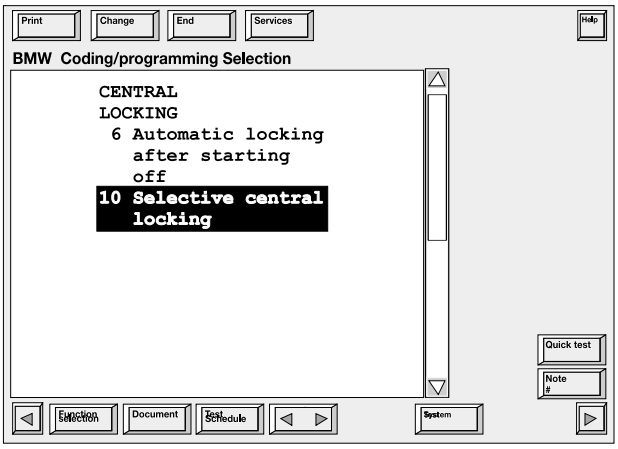
Similar to the CAR MEMORY main menu, the KEY MEMORY main menu provides all of the possible configuration options.

As an example, the owner requires the selective unlocking feature be deactivated.



- Press 2. CENTRAL LOCKING and press the continue arrow.

- From the displayed list select "10 Selective central locking" and press the continue arrow.



The blue "=" sign indicates what mode this particular function is set to currently.

- Select the "not active" function and press the continue arrow.

The system will accept the selection and bring the KEY MEMORY main selection menu back in the display.

If additional selections are required, enter into the systems displayed and repeat the steps from above.

- When all of the required KEY MEMORY configuration selections are entered, select 99 SET VEHICLE.

The next screen displays all of the selected configuration changes.

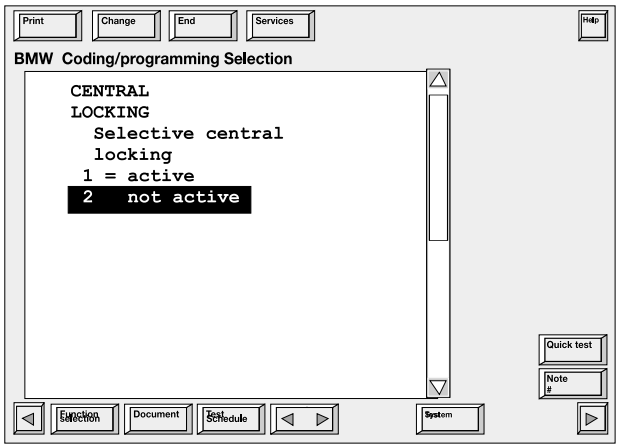
Check the displayed list against the Owner's selection list making sure all of the choices are entered. Print this list out and place in the vehicle history file for future reference if necessary.

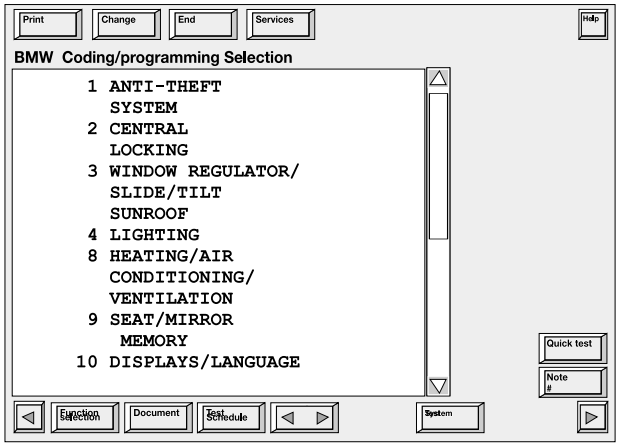
- Press the continue arrow to proceed with the configuration.

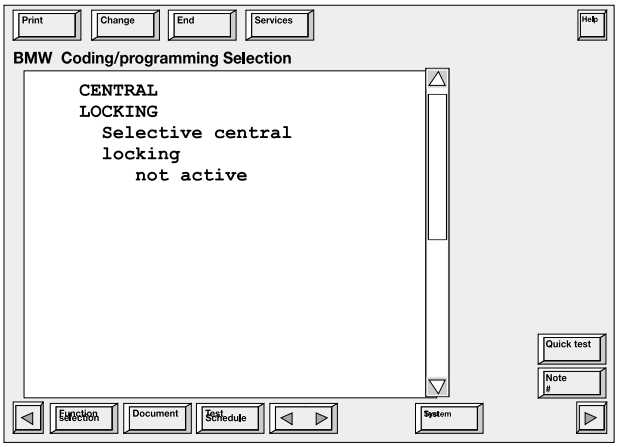
The next display will request that the ignition switch be "switched off and on again". Press the "Yes" button to continue.

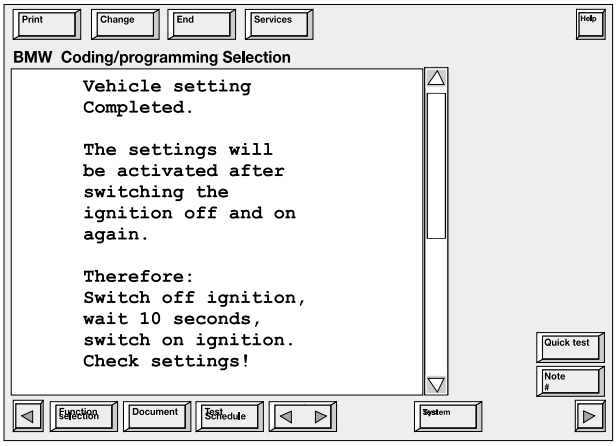
A bar graph indicating configuration process is displayed along with the current battery voltage.

The display will change indicating the "Vehicle setting completed". Turn the ignition switch back off for 10 seconds and then back on. Verify the configuration change(s) by activating the new function.





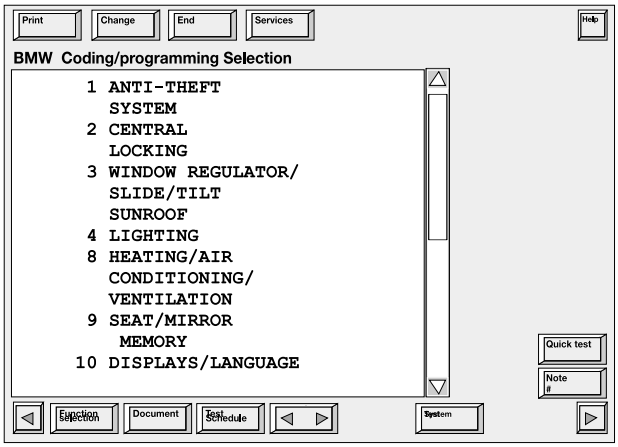




Also located at the bottom of both the CAR & KEY selection menus are the possible selections:

- 97 FACTORY SETTING - This selection automatically resets the original factory default settings

- 98 REJECT SELECTION - This selection resets the last selected entry to the previous setting.



During the operation of the FACTORY SETTING selection, it is a normal function for the LCM III controlled lights to flash.

Symbols: **=** The equal sign signifies the current mode of function

> The arrow symbol signifies selected changes to be encoded when all selections are completed. This symbol can be seen when returning to a selection menu to check on selected modes of operation prior to “99 Set Vehicle”.

✱ The asterisk indicates the factory default encoding function after encoding.

CAR/KEY CONFIGURATION AND THE ZCS CODING CONVERSION FEATURE

The ZCS Coding Conversion feature is still utilized for changing other system functions as in the past. For example: The Language Display Change for the instrument cluster display block is only available using the Coding Conversion feature.

CAR/KEY MEMORY SERVICE CONSIDERATIONS

Replacing Car or Key Memory Configured Control Modules:

If a Car/Key Memory capable control module becomes defective and needs replacement, the specific customized data will be transferred over to the new replacement unit during the ZCS encoding process.

If this is not possible due to extensive control module failure, the owner must be made aware of the situation and requested to provide the options they originally selected. For this reason, it is advantageous to print the selected features as mentioned in the CAR & KEY MEMORY configuration procedures.

FZV Key Initialization Procedure:

Also mentioned in the FZV section of this manual, If FZV keys need re-initializing, make sure they are initialized in the same order. Adhere to the colored label identification system for proper key initialization sequencing.

Technician Awareness:

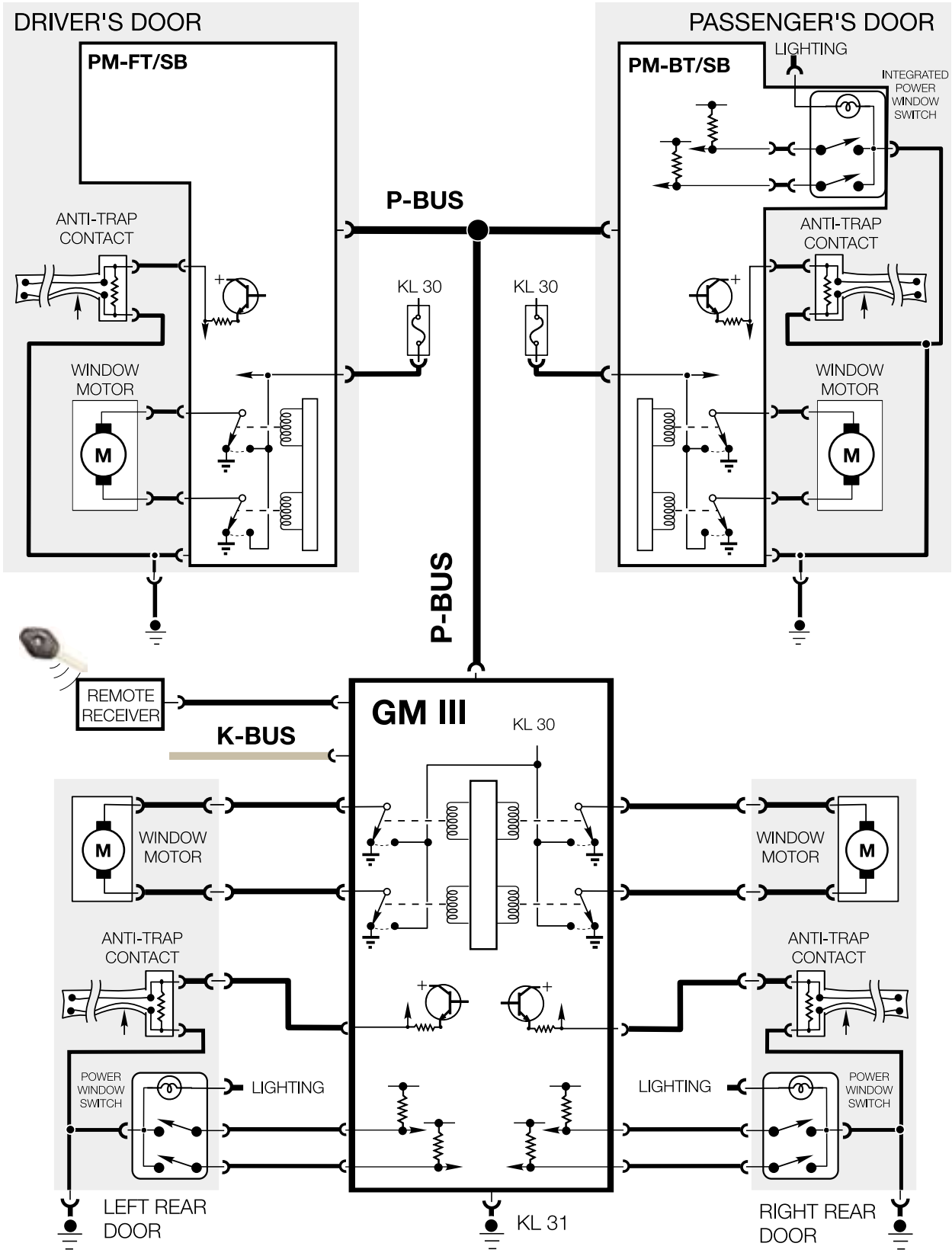
Car Memory/Key Memory Configuration obviously changes the functionality of the systems. Before concluding a specific system is defective, review the Car/Key memory selection for the vehicle you are working on. There may be an owner selected function activated that is not a common selection, causing misunderstanding of the system's function.

When working on a Car/Key Memory capable vehicle, avoid using the FZV keys. Use the driver's door lock to lock and unlock the vehicle to maintain the owners memorized settings. If settings had to be modified as part of repair procedure, inform service advisor of situation to convey to vehicle owner.

POWER WINDOWS

The power window operation on the E53 is similar to previous systems. Features of the system include:

- Control of the front and rear door window motors is carried out directly by the GM.
- One-touch operation in both directions on all four windows.
- Cable type window regulator used for all windows.
- Anti-trap detection is provided by the pressure sensitive finger guard .
- Push/pull window switches
- The rear window switches located in the rear doors can be deactivated by the pressing child lock out switch in the center console.
- Convenience closing/opening of the windows from the driver's lock cylinder or convenience opening only from the FZV remote key (FZV operation can be owner customized with the Car Memory Function).
- Window operation with the ignition switched off until a door is opened or 16 minutes has elapsed after the key is switched off.
- Window load switching is through relays integral of the GM for rear windows and in the respective door switchblock modules for the front windows. The current draw is monitored for end limit position. The maximum run time for the window motors is limited to 8 seconds. This allows the motors to be switched off if the end limit load sensing fails.


DRIVER'S DOOR
PM-FT/SB
ANTI-TRAP CONTACT
WINDOW MOTOR
M
P-BUS
KL 30
KL 30
PASSENGER'S DOOR
PM-BT/SB
LIGHTING
INTEGRATED POWER WINDOW SWITCH
ANTI-TRAP CONTACT
WINDOW MOTOR
M
P-BUS
REMOTE RECEIVER
K-BUS
GM III
KL 30
WINDOW MOTOR
M
ANTI-TRAP CONTACT
POWER WINDOW SWITCH
LIGHTING
LEFT REAR DOOR
KL 31
LIGHTING
POWER WINDOW SWITCH
WINDOW MOTOR
M
ANTI-TRAP CONTACT
RIGHT REAR DOOR

WINDOW ANTI-TRAP DETECTION

The window anti-trap detection feature is only active in the one touch and convenience close modes of operation. If the window switch is pushed/pulled and held, the Anti-trap feature will not function.

The rubber pressure guard located at the top edge of each door frame consists of two contact strips that close when subjected to pressure. This provides anti-trap detection and signal generation to the GM.

When the contact strip closes, the window immediately (10ms) reverses direction as with previous anti-trap systems. The contact strip does not require that the anti-trap feature be initialized prior to operation.

The pressure sensor finger guard has a resistance of 3.0 KOhm and it is monitored for open circuit. When pressed, the monitored resistance changes to <1KOhm. Faults with the anti-trap system require that the window switch be held to close the window.

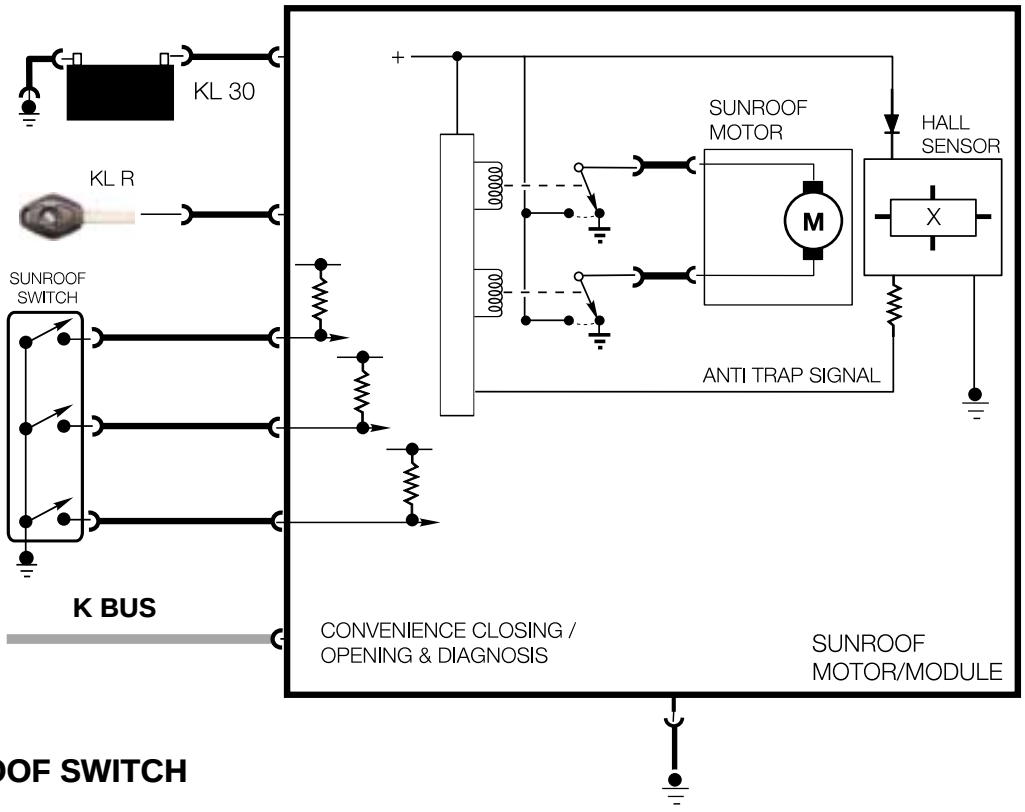
CONVENIENCE OPENING/CLOSING

The GM and Front Door Switchblock Modules provide the convenience open/close feature providing control of the power windows (and sunroof) from outside the vehicle with the key in the driver's door lock. The FZV provides the same function for the opening only.

- The anti-trap feature is active during convenience closing from the driver's door lock.
- The convenience open feature provides outside activation of the windows and sunroof in the same manner.
- If the GM receives a request to operate convenience close or open for more than 110 seconds, the function is deactivated and a fault code is stored.
- The Car Memory Feature can activate and deactivate the Convenience Open Feature from the FZV's control.

SUNROOF

The sunroof is mechanically similar to previous systems. All of the electronic controls and relays are contained in the sunroof module (SHD). The module is connected to the K-Bus for comfort closing/opening, unloader signalling during engine startup, diagnosis and fault memory purposes



SUNROOF SWITCH

Mounted in the sunroof motor trim cover is the sunroof switch. Also similar to previous systems, the switch provides coded ground signals for system operation.

The following switch signals are generated over three wires through coded combinations:

- Rest position
- Slide open request (press and hold switch - first detent of open position)
- Automatic slide open request (press further to second detent and release)
- Tilt open (press and hold)
- Slide close request (press and hold switch - first detent of close direction)
- Automatic slide close request (press further to second detent and release)

SUNROOF MOTOR/MODULE (SHD)

The combined motor module has a 13 pin connector for interfacing the switch, and vehicle harness (power ground and K bus.)

The motor contains two hall effect sensors that monitor the motor shaft rotation providing sunroof panel position.

The hall sensors also provide the end limit cut out function for the SHD once the system is initialized. The SHD counts the pulses and cuts the motor out prior to the detected end run of the sunroof panel.

INITIALIZATION

Initialization is required for the SHD to learn the end positions of the motor's travel. The hall sensors provide pulses for motor rotation, the SHD counts the pulses and determines where the panel is by memorizing the stored pulses.

If the system is not initialized, the sunroof will only operate in the tilt up and slide close positions. Initialize as follows:

- Press and hold the sunroof switch in either the tilt up or slide close positions for 15 seconds.

- The sunroof motor operate momentarily signifying initialization acceptance.

The SHD memorizes the pulses from the hall sensors on the next activation of the motor by driving the panel to its end run positions. The SHD senses an amperage increase and determines the end run position. The counted number of pulses is then used as the basis for calculating the panel position.

ANTI TRAP FEATURE

The anti-trap feature of the sunroof uses a hall sensor to detect obstructions while the sunroof is closing (pulse frequency slowed down) in the automatic close function. The anti-trap feature is shut down prior to full closing (4mm from full closed) to allow the sunroof the seat into the seal.

Additionally, the anti-trap feature is not functional when the switch is held in the manual close position.

SHD SELF DIAGNOSIS

The SHD monitors its operation and stores fault codes if a defect is determined: The SHD monitors the following conditions:

- **SHD motor relays:** The relays are checked for sticking contacts (plausibility) and non functional contacts.

- **Hall effect position sensors:** The SHD must detect a pulse frequency from the hall effect sensor(s) during operation.

- **Sunroof Switch:** The SHD monitors the signal plausibility of the coded signaling from the sunroof switch.

SUNROOF FAULT RESPONSE CHARACTERISTICS

If a fault occurs with any of these functions, the SHD responds as follows:

- Overrides the end run detection.
- Switches the motor off if the relay contacts stick for more than 500 ms.
- Switches the motor off if pulses are not received.

EMERGENCY OPERATION OF SUNROOF

If the sunroof motor does not respond to the switch signals, the hex key in the trunk lid tool kit is used to manually turn the motor shaft drive as on previous systems

INTERIOR LIGHTING

The GM controls the interior lighting automatically with the status change of several monitored inputs. The lighting can also be manually controlled using the interior light switch.

COMPONENTS

DOOR CONTACTS: The door lock actuators contain a hall effect sensor for the purpose of monitoring door open/closed status (hall sensor 3 in the driver's door actuator). The hall effect sensor is located directly behind the rotary latch plate encased in the actuator. The sensor is activated by the rotary latch plate's position. A change in current flow informs the General module when a door is opened or closed.

Front seat interior/map light unit: The overhead front seat interior/map light unit contains a single main interior light. The light is controlled by the GM automatically or by momentarily pressing interior light switch located on the light assembly. The switch provides a momentary ground signal that the GM recognizes as a request to either turn the light on (if off) or turn the light off (if on).

If the switch is held for more than 3 seconds, the GM interprets the continuous ground signal as a request to turn the interior light circuit off for the Workshop Mode as on previous systems. The workshop mode is stored in memory and will not come back on even if the GM is removed from it's power supply and reconnected. The switch must be pressed to turn the lights back on.

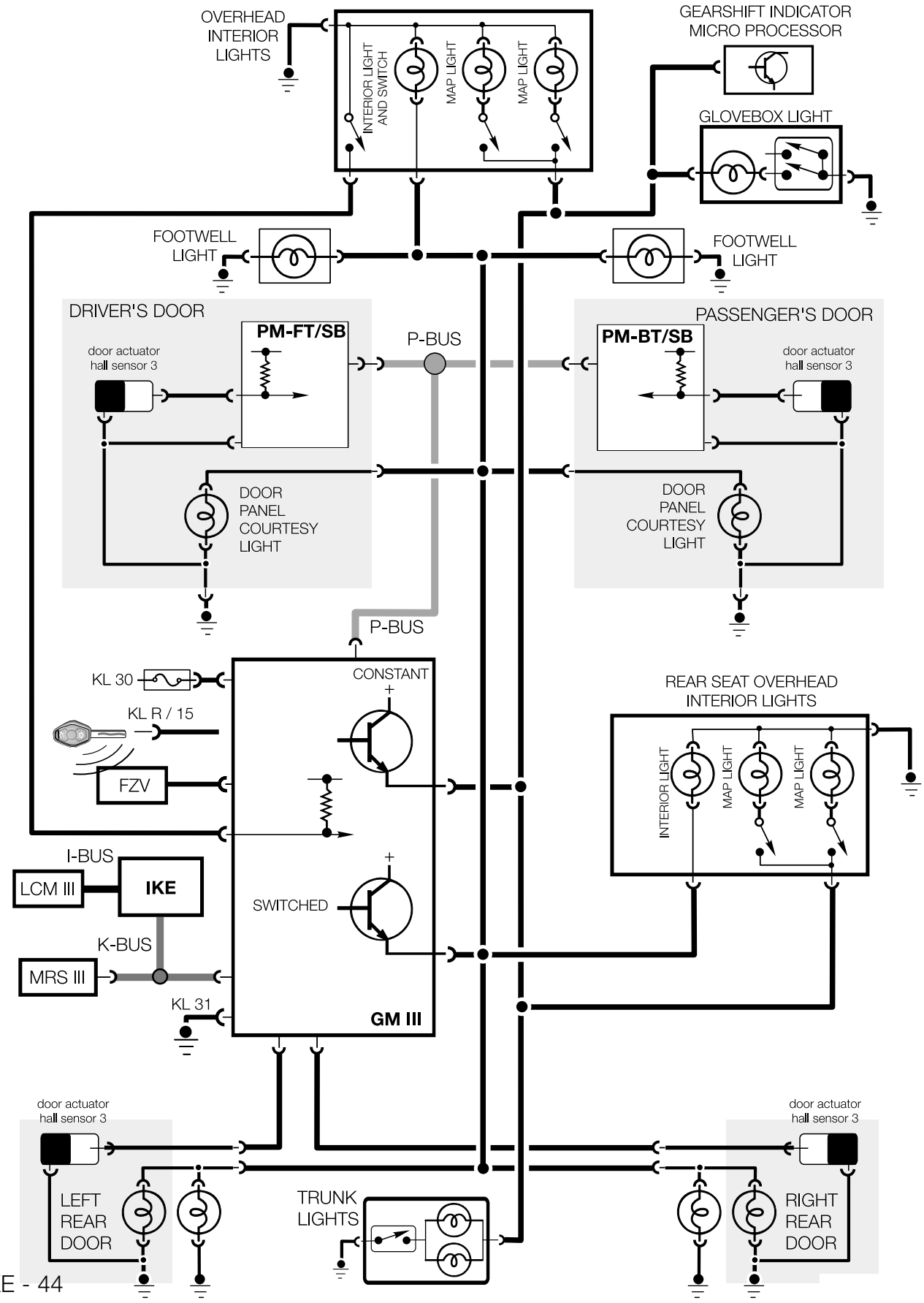
There are two reading/map lights also located in the assembly. Each map light is mechanically controlled by depressing it's corresponding on/off switch. The power supply for the map lights is supplied by the GM through the Consumer Cut Off circuit.

Rear seat interior light unit:

In the center headliner is an additional interior/reading light unit. This unit contains an interior light that is controlled with the front interior light and a mechanically switched reading light on the consumer cut off circuit.

Front footwell lights:

In each front footwell, there is also a courtesy light. These lights are only operated when the GM provides power to the interior lighting circuit.


OVERHEAD INTERIOR LIGHTS
INTERIOR LIGHT AND SWITCH
MAP LIGHT
MAP LIGHT
GEARSHIFT INDICATOR MICRO PROCESSOR
GLOVEBOX LIGHT
FOOTWELL LIGHT
FOOTWELL LIGHT
DRIVER'S DOOR
PM-FT/SB
door actuator hall sensor 3
P-BUS
PASSENGER'S DOOR
PM-BT/SB
door actuator hall sensor 3
DOOR PANEL COURTESY LIGHT
DOOR PANEL COURTESY LIGHT
P-BUS
KL 30
CONSTANT
KL R / 15
FZV
REAR SEAT OVERHEAD INTERIOR LIGHTS
INTERIOR LIGHT
MAP LIGHT
MAP LIGHT
I-BUS
LCM III
IKE
SWITCHED
K-BUS
MRS III
KL 31
GM III
door actuator hall sensor 3
door actuator hall sensor 3
LEFT REAR DOOR
TRUNK LIGHTS
RIGHT REAR DOOR

AUTOMATIC CONTROL FUNCTION

The GM provides 12 volts (linear application providing soft on feature) to the interior lighting circuit when the one of the following input signal statuses change:

- Door contact hall sensor active (door opened)
- An Unlock request from the driver's door key lock hall sensors are received. This only occurs if the ignition switch is off.
- An Unlock request is from the FZV keyless entry system is received via the K bus. This only occurs if the ignition switch is off as well.
- The ignition switch is switched off and the vehicle exterior lights (LCM III) have been on for a minimum of 2 minutes prior. This information is provided to the GM via the K bus.
- Active crash signal from the MRS III control module.
- Lock button of FZV key is pressed with the vehicle is already locked (interior search function).

The GM gradually reduces the full 12 volt power supply (linear reduction providing soft off) until the lights are off when the following input signal statuses change:

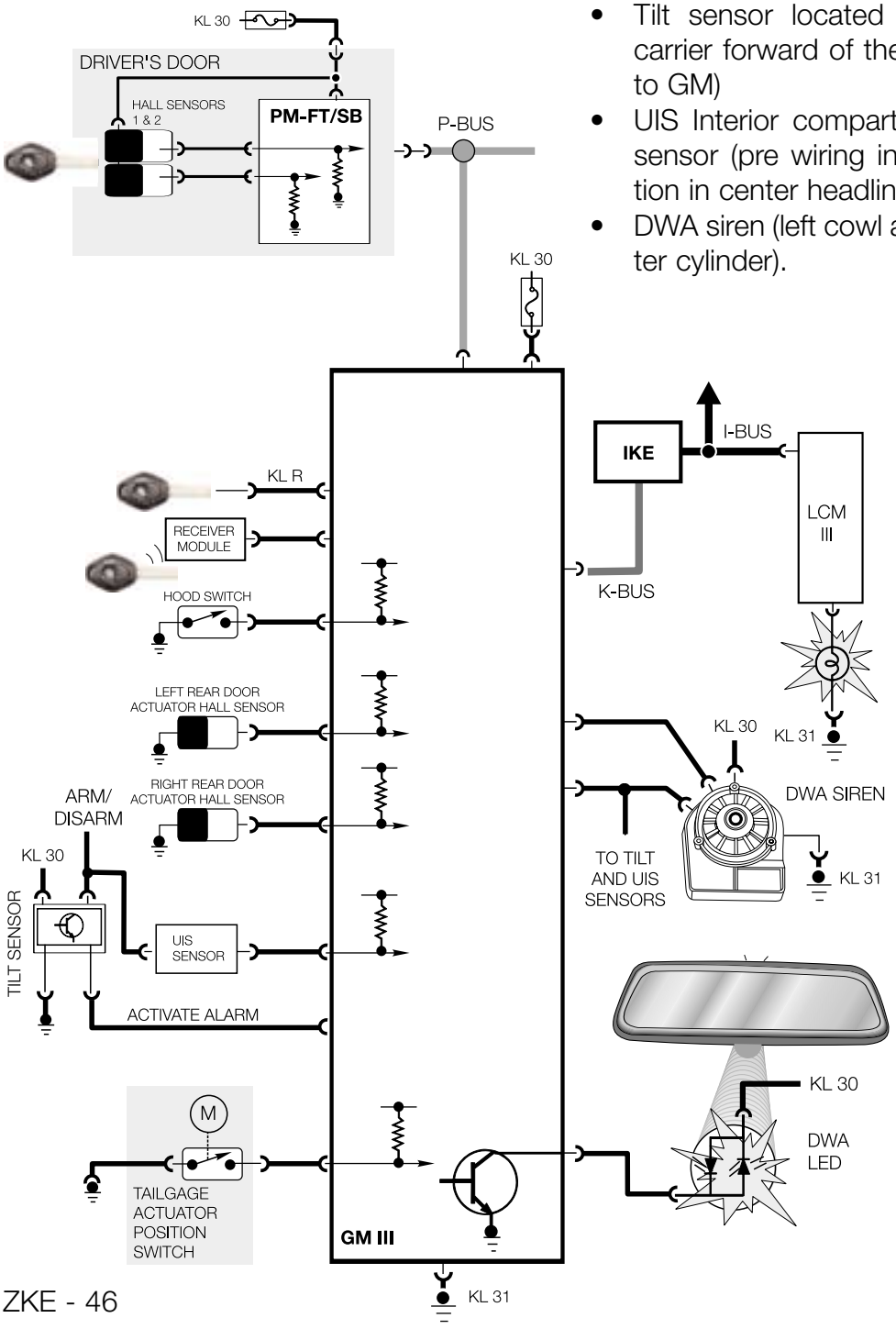
- Immediately after the ignition switch is turned to KL R with the driver's door hall sensor door contact closed.
- When the vehicle is locked (single or double) with the door contacts closed.
- When the vehicle door contacts are closed. The lights remain on for 20 seconds and then go to soft off.
- After the interior search function is activated, the lights will automatically turn off (soft off) after 8 seconds.
- After 16 minutes with a door contact active (open door) and the key off, the lights are switched off (consumer cutoff function).
- The component activation function of the DIS also has the ability to switch the lights.

The Interior lighting output circuit of the GM is approximately 3.5 amps with all lights on.

ANTI-THEFT (DWA) SYSTEM

The GM utilizes the following components to provide the DWA function:

- Door lock hall effect sensor contacts (door open/closed).
- Tailgate lid switch contact (monitored for closed tailgate).
- Hood switch (monitored for closed hood, located under the hood).
- DWA status LED (part of rear view mirror).
- Tilt sensor located in the electrical carrier forward of the glove box (next to GM)
- UIS Interior compartment monitoring sensor (pre wiring in area of installation in center headliner).
- DWA siren (left cowl area next to master cylinder).



COMPONENTS

DOOR CONTACTS

As mentioned in the Central Locking Section, the door lock contact hall effect sensors provide status of door open/closed. The GM will activate the siren if a door open signal becomes active when the DWA is armed.

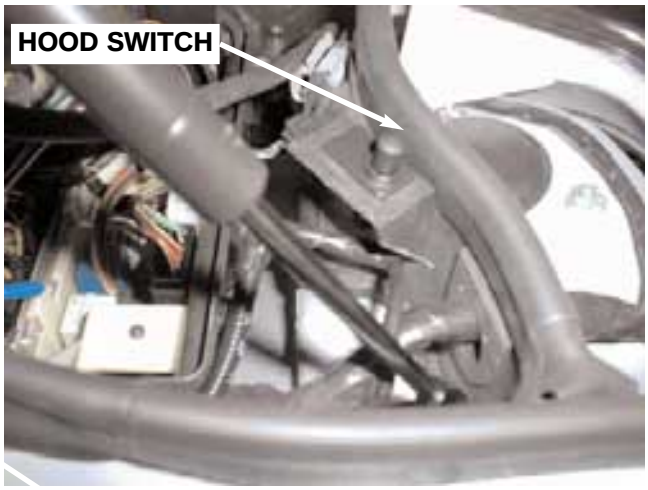
TAILGATE SWITCH CONTACTS

The tailgate switch contact is located in the tailgate lock actuator assembly. When closed, the tailgate contact provides a ground signal to the GM signifying a "closed tailgate". The GM will activate the siren if the tailgate switch contact ground signal opens when the DWA is armed.

HOOD CONTACT SWITCH

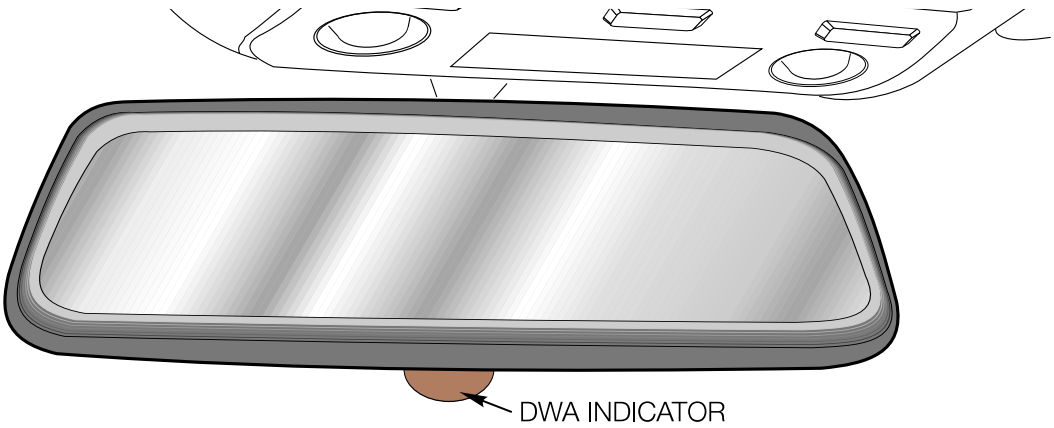
Located on the right side engine compartment, the hood contact switch provides a ground signal to the GM signifying an open hood.

The plunger of this switch can be pulled up past a detent causing the switch contact to open. This feature can be used to simulate a closed hood with the hood open when diagnosing the DWA system.



DWA LED

The LED is provided with constant battery voltage (KL 30). The GM provides a switched ground signal providing the various blinking signals used to convey DWA status to the vehicle operator (covered further on).



TILT SENSOR

Located in the electrical carrier forward of the glove box, the tilt sensor is an electronic sensing device with the sole purpose of monitoring the vehicle's parked angle when DWA is armed.

The sensor requires three signal wires to perform its function:

- KL 30 - Constant battery voltage

- Signal "STDWA"; switched ground input signal provided by the GM indicating DWA armed/disarmed status. The tilt sensor is used as a splice location for the STDWA signal to the Siren and FIS interior protection sensor.

- Signal "NG"; switched ground output signal provided to the GM. The signal is used for two purposes,

    1. As a momentary acknowledgment that the tilt sensor received STDWA and is currently monitoring the vehicle angle.

    2. If the tilt sensor detects a change in the vehicle's angle when DWA is armed, signal NG is switched to inform the GM to activate the siren.

When the tilt sensor receives the STDWA signal from the GM it memorizes the vehicle's parked angle. The angle of the vehicle is monitored by the solid state electronics. Once armed, if the angle changes, the tilt sensor provides a switched ground signal to the GM to activate DWA.

INTERIOR PROTECTION (UIS)

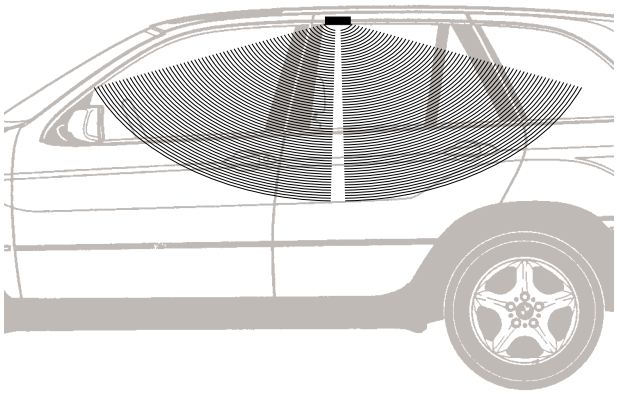
The UIS monitors the vehicle interior for motion through ultrasonic sound waves. The UIS is a combined transmitter and receiver.

The X5 UIS sensor is incorporated into the rear seat interior light trim cover. It is a two piece unit with cable connection to the rear transmitter/receiver.

The UIS and trim panel are clearly identified with arrows indicating forward mounting direction.

Due to the design of the vehicles interior, the sensor is uni-directional and must be installed in the proper direction to ensure proper operation of the system (trim cover ensures directional installation).

Every time the DWA system is armed (signal STDWA), the sensor adapts to what ever objects might be stationary in the interior.



The sensor emits ultra sonic waves in a programmed timed cycle. It receives echos of the emitted waves.

The UIS amplifies the received sound wave signals and compares them with the transmitted waves. The UIS also checks the incoming echos for background hiss (wind noise through a partially open window) and adapts for this.

- If the echos are consistently similar, no movement is detected,
- If the echos are altered, (inconsistent), the UIS determines motion in the interior compartment.

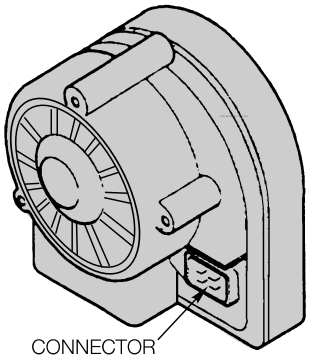
If motion is detected, the UIS changes to a constant cycle and the echo is compared again. If the inconsistency is still present the UIS sends the activate siren signal (INRS) to the GM.

As with the tilt sensor, the UIS is also switched OFF when the vehicle is locked two times within ten seconds. This allows the sensor to be switched OFF for transportation purposes.

ALARM SIREN

The siren is located in the vehicle cowl on the driver's side of the vehicle. This location provides a secure position with loud acoustic output.

The siren contains electronic circuitry for producing the warning tone when the alarm is triggered. The siren also contains a rechargeable battery that is used to power the siren when the alarm is triggered.

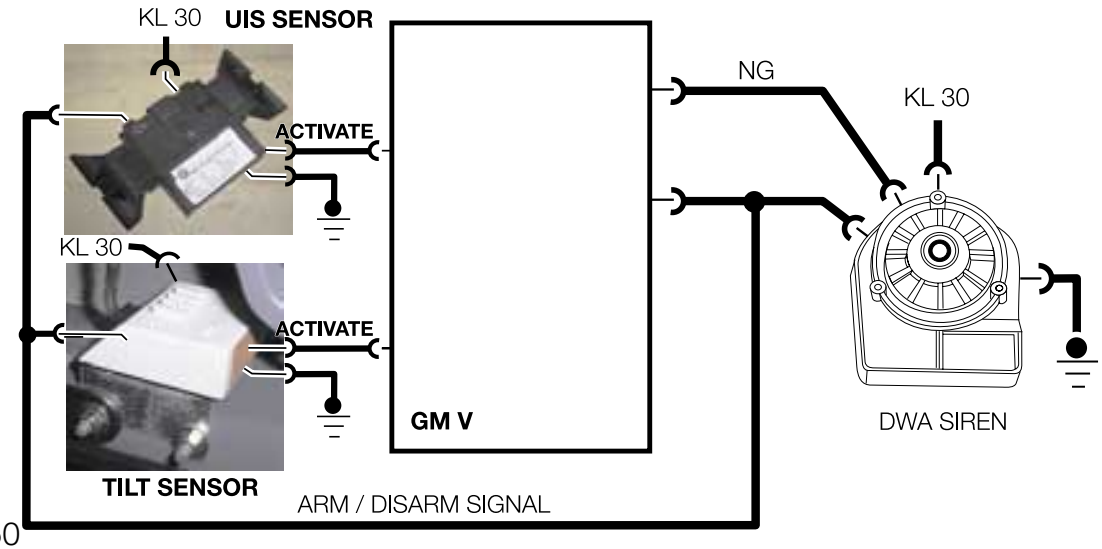


The rechargeable battery will allow the siren to sound if it or the vehicle's battery is dis-connected. The siren battery is recharged, from the vehicle's battery when DWA is not in the armed state.

The siren has four wires connecting it to the system; KL 30, KL 31, Signal STDWA (arm/disarm signal from GM), and Signal NG (activate siren output signal to the GM)

The arm/disarm output signal from the GM (STDWA) is provided to the Tilt sensor, FIS sensor and the siren simultaneously. The arm/disarm signal is a switched ground that signals the components of DWA armed/disarmed status.

The activate siren signal (NG) is high whether DWA is armed or disarmed. If a monitored input activates the alarm, the high signal to the siren is switched to a 50% duty cycle at the GM. The control circuitry in the siren activates the siren driver. If the DWA is armed and the battery is disconnected the siren recognizes the normally high "NG" signal as suddenly going low, the siren is also activated.



DWA ARMING/DISARMING

- The DWA is armed every time the vehicle is locked from the outside with the door lock cylinder or FZV key.

- The LED in the rear view mirror flashes as an acknowledgment along with the exterior lights and a momentary chirp from the siren.

- The GM monitors all required input signals for closed status (door closed, tailgate closed, etc.) The inputs must be in a closed status for a minimum of 3 seconds for the GM to include them as an activation component. If after 3 seconds any input signal not in the closed status is excluded (this is acknowledged by the DWA LED) preventing false alarm activation's.

- If the DWA is armed a second time within 10 seconds, the tilt sensor and interior protection sensor are also excluded as alarm activation components. This function is useful if the vehicle is transported on a train or flat bed truck to prevent false alarm activation's.

- While armed the tailgate can be opened with out the alarm being triggered as follows:

  - If opened with the tailgate remote button via the FZV, the GM prevents the alarm from activating. (This feature is customizable under the Car Memory function).

  - If opened with the key at the tailgate lock cylinder the tailgate key position switch signals the GM and in the same manner prevents the alarm from activating.

    In either case, when the tailgate is returned to the closed position, it is no longer considered as an activation signal.

Panic Mode Operation: When the tailgate button is pressed and held, the GM is signaled to activate the siren for the Panic Mode. The panic mode will function with either an armed or disarmed DWA system.

EMERGENCY DISARMING

Emergency disarming occurs automatically if a key is used to turn the ignition switch on and the EWS III accepts it. The EWS III signals the GM to unlock the doors and deactivate the DWA.

ALARM INDICATION

When the alarm is triggered, the siren will sound for 30 seconds. At the same time the low beam headlights and four way flashers will flash for 5 minutes. The GM signals the the LCM III via the K bus -- I bus to flash the lights.

Following an alarm trigger, the system will reset and trigger again if further tampering is done to the vehicle.

DWA LED STATUS

DWA STATUS	DWA LED CONDITION
Disarmed	OFF
Armed	Continual slow flash
Armed with one or more monitored inputs not in closed position (ie: trunk not fully closed, etc)	Rapid flash for 10 seconds, then continual slow flash.
Alarm activated	Rapid flash for 5 minutes, then continual slow flash.
Rearmed in less then 10 seconds.	ON for 1 second
Disarmed after activated alarm	Rapid flash for 10 seconds, then OFF.

DRIVER'S SEAT MEMORY FUNCTION

As with previous systems, the seat memory feature of the SM stores three seat positions for recall. The positions are stored in a non-volatile memory preventing loss of positions if in case the SM or the battery is disconnected.

The additional buttons on the SM (M) provide activation of recording memory position and (1-2-3) for storing or recalling a specific seat setting.

Storing current seat position:

- Seat in desired position,
- Ignition switch in KL R,
- Press the M button until it illuminates
- Within 7 seconds press the 1,2 or 3 button to store.

The stored position can be recalled at any time by pressing the appropriate memory location button (1-2-3).

MEMORY RECALL MODES OF OPERATION

Depending on current SM input signals via K-Bus, the memory recall operates in two distinctly different modes:

- One-touch mode (TTB),
- or press and hold mode of operation (DTB).

If the following input signal status is current, the SM resets the seat position by a momentary **"one touch"** of the selected memory button.

- Ignition switch off with the driver's door open, or,
- KL R on, door open or closed

If the following input signal status is current, the SM resets the seat position by a continuous **"press and hold"** of the selected memory button.

- Ignition switch off with the driver's door closed
- KL 15 on, door open or closed.

DRIVER'S SEAT MEMORY (CAR Memory Influence)

The PM-SM can be encoded to recall a specific seat position for a vehicle user when the GM signals the SM to automatically recall stored positions separate of the 1-2-3 button selections.

This feature is encoded through the car memory function and activated by the key memory function. The PM-SM will monitor the seat position and store it in another area of it's memory when the vehicle is locked with the remote keyless entry system. The GM sends a request to memorize the seat position and store it for FZV key user 1,2,3 or 4.

If another user of the vehicle changes the seat position the PM-SM restores the memory position the next time the specific key is used to unlock the vehicle.

This feature can be further modified to activate the position recall based on the owner's selected activation scenario, for example: The owner can choose to :

- Disable this feature,
- Initiate memory recall when the unlock signal is initially sent before a door is opened.
- Initiate memory recall when the unlock signal is sent but only when the driver's door is opened.

See Car Memory Key Memory for additional information.

POWER SEAT DIAGNOSIS

The PM-SM communicates with the DIS or MoDiC via the K bus - instrument cluster gateway - to the P-bus. The PM-SM monitors the seat motors and circuits as well as it's internal operation. Any detected faults are stored in the PM-SM fault memory and are called up when diagnosing the system with the Fault Symptom diagnostic plan.

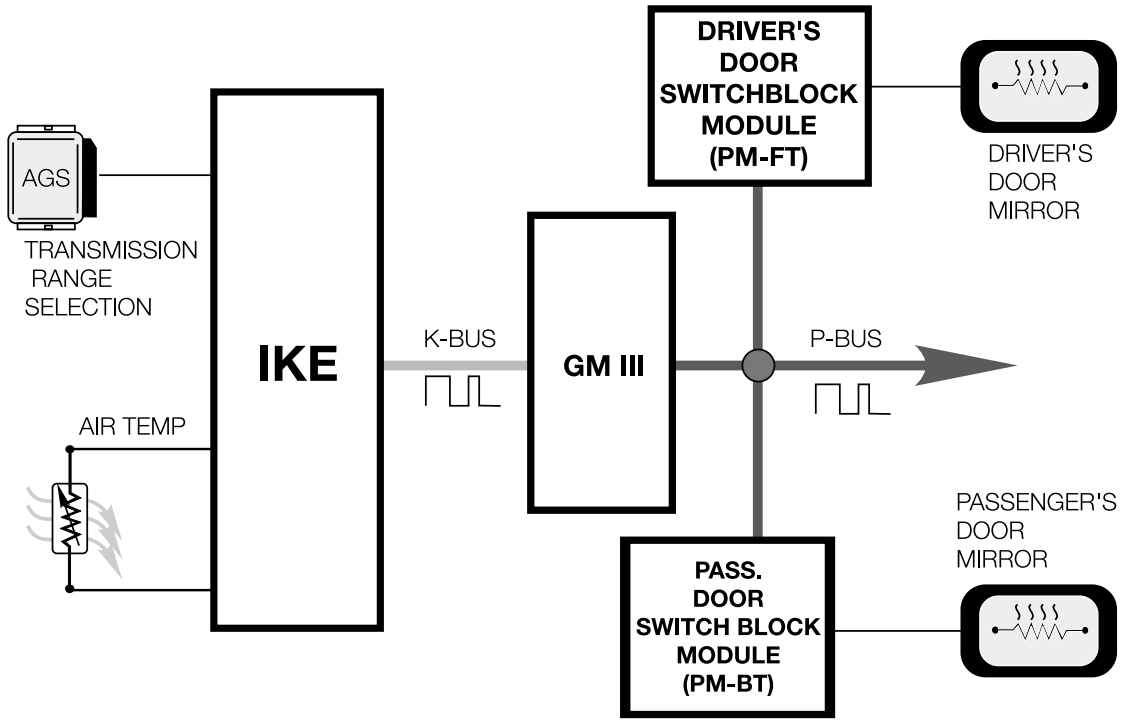
The PM-SM also provides status display to the DIS of its input and output control signals as well as component activation.

MIRROR OPERATION

The output stages and memory storage of mirror positions is handled by the respective door modules. The positioning of the mirrors is signaled from the driver's door switch block/module. The signal passes over the P-Bus to the passenger's door module.

The memory/recall for the driver's mirror comes directly into the door module from the memory switch. The operation for the passenger's side mirror is carried out over the P-Bus from the driver's door module to the passenger's door module.

The memory positions are stored in each respective module. The memory position is recognized by the feedback potentiometers located on each mirror motor.

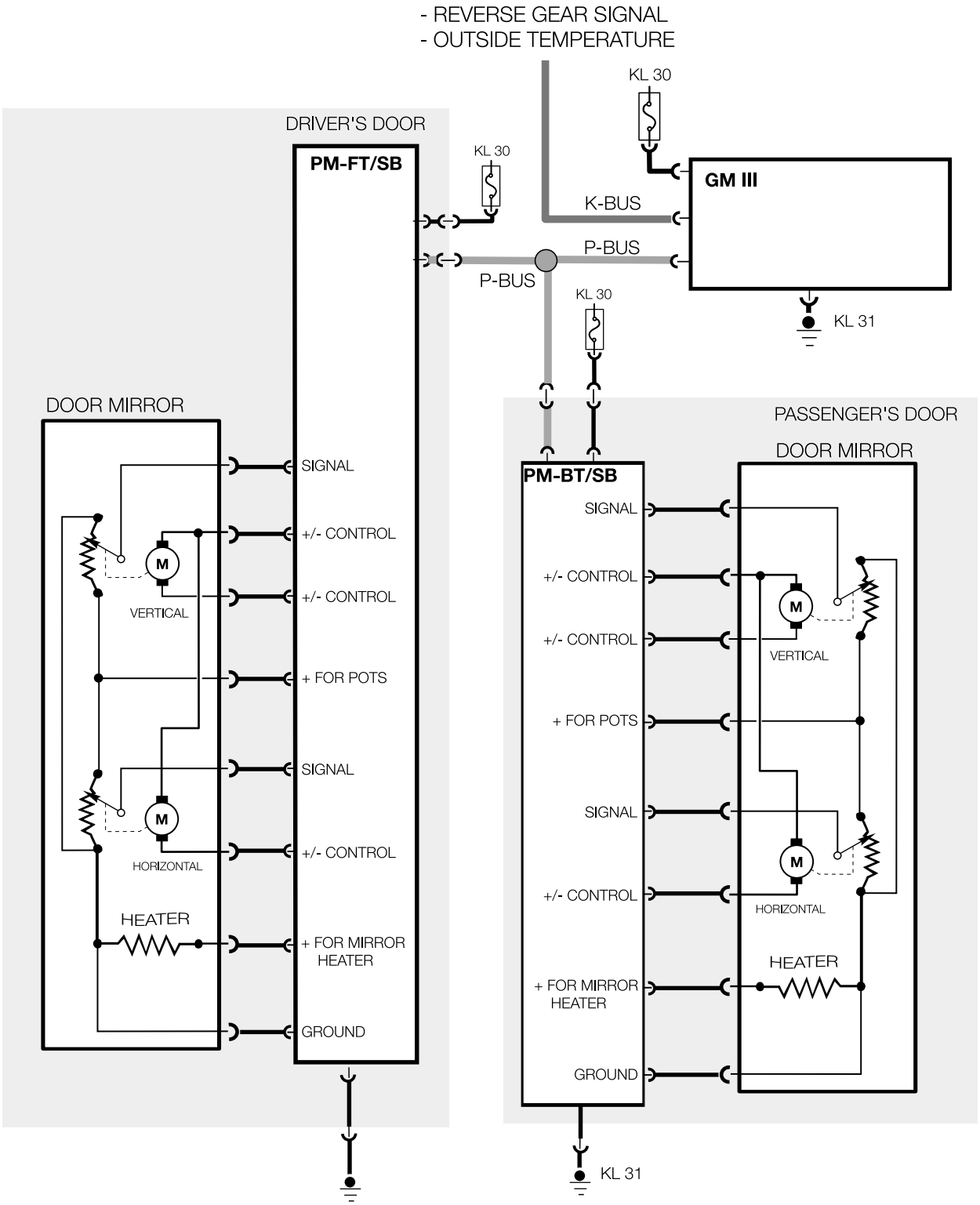


The reverse gear tilt feature for the passenger's mirror is signaled from the GM III, over the P-bus, when reverse is selected and the mirror switch is set for the driver's side.

Mirror heating is controlled by each respective door module. The GM III receives the outside temperature from the IKE and passes it to the door modules. The "ON" time for mirror heating is adjusted based on the outside temperature.

A pulsed heating cycle is used for the mirrors based on the outside temperature.

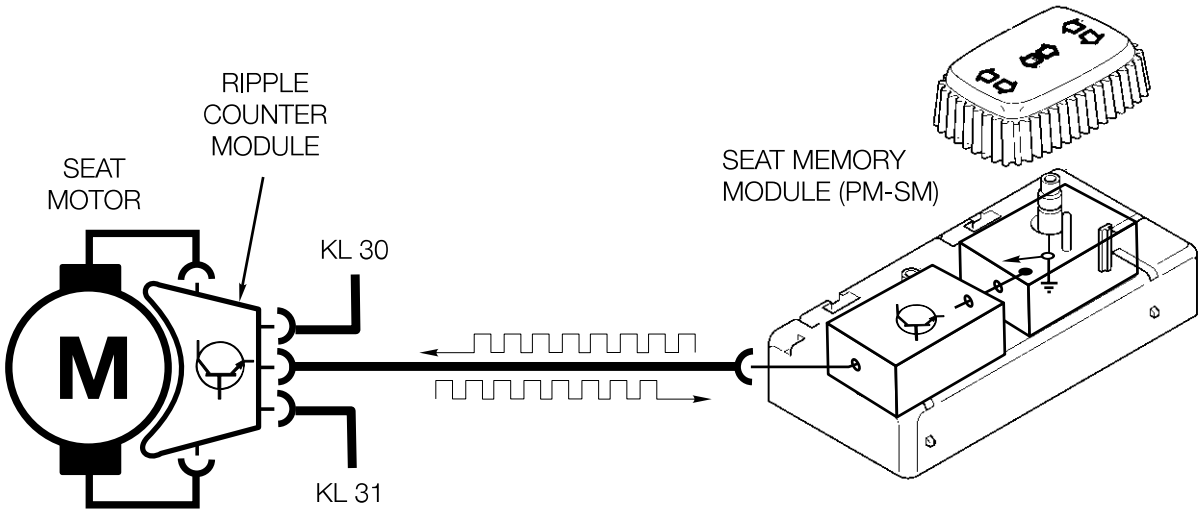
Temperature	<-10°C	-10 to 0°C	0 to 15°C	15 to 25°C	>25°C
ON - duration	100%	75%	50%	25%	5%


- REVERSE GEAR SIGNAL
- OUTSIDE TEMPERATURE
KL 30
GM III
K-BUS
P-BUS
P-BUS
KL 30
KL 31
KL 30
DRIVER'S DOOR
PM-FT/SB
DOOR MIRROR
SIGNAL
+/- CONTROL
+/- CONTROL
VERTICAL
+ FOR POTS
SIGNAL
+/- CONTROL
HORIZONTAL
HEATER
+ FOR MIRROR HEATER
GROUND
PASSENGER'S DOOR
DOOR MIRROR
PM-BT/SB
SIGNAL
+/- CONTROL
+/- CONTROL
VERTICAL
+ FOR POTS
SIGNAL
+/- CONTROL
HORIZONTAL
HEATER
+ FOR MIRROR HEATER
GROUND
KL 31

SEAT OPERATION

Each motor for seat adjustment contains a micro-processor (called a Ripple Counter) that receives a digital signal from the seat control module for motor activation. The motors are connected to KL 30 and KL 31 and respond to the signals generated by the seat module when seat movement is requested. The seat adjustment switch provides ground input signals to the module when seat movement is desired. The module processes these input signals and sends output signals to the seat motor processors. The seat motor processors activate the motors and the seat moves to the desired point.

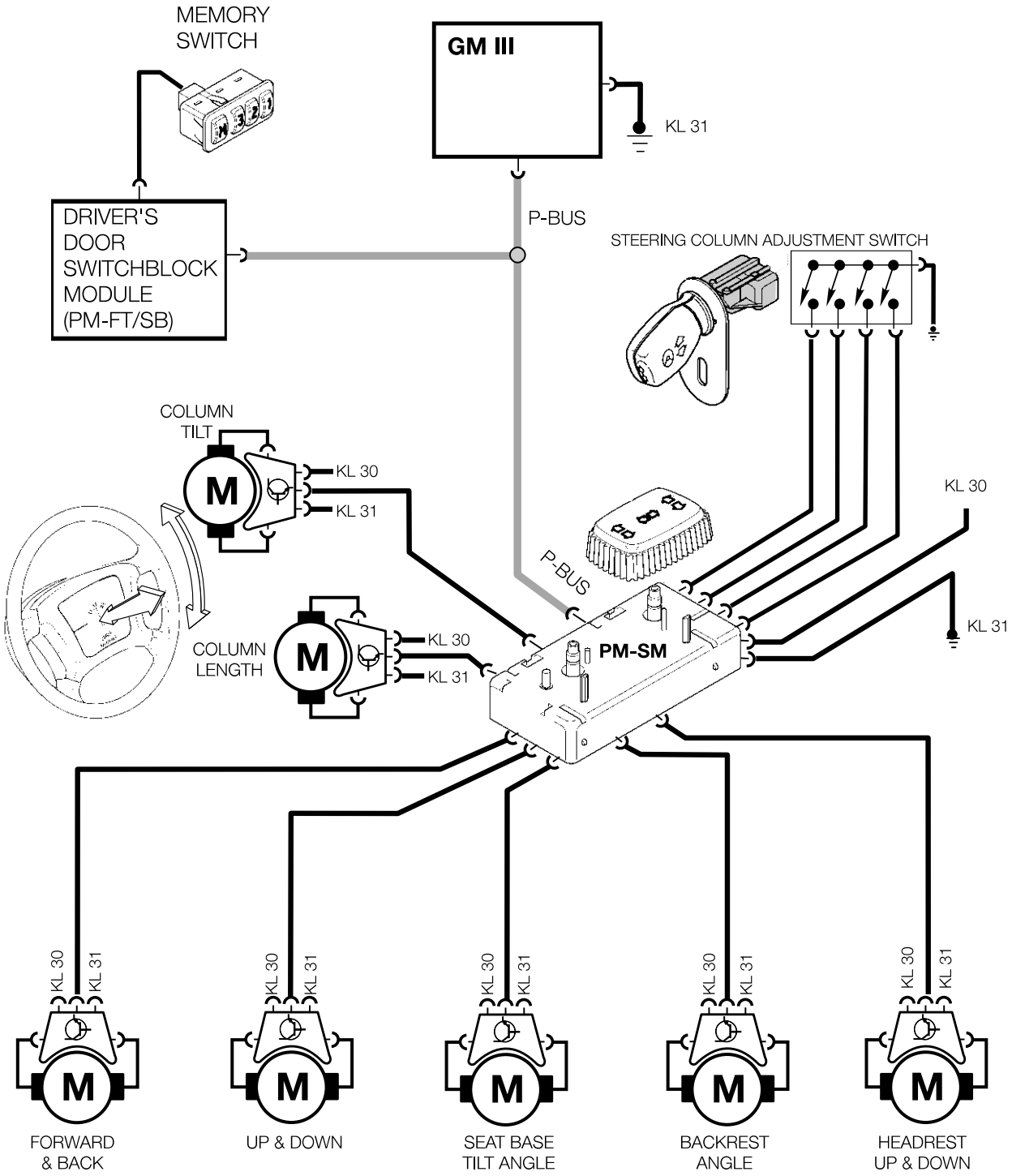
The circuitry of the Ripple Counter detects the motor activation current. As the armature segments of the motor rotate passed the brushes, the current flow rises and falls producing a ripple effect. The peaks of these ripples are counted and stored in the Ripple Counter module. The memory function of the seat module uses this ripple count instead of feedback potentiometers to memorize and recall seat positions.



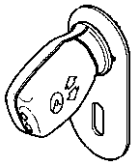
RIPPLE COUNT RECOGNITION

When the seat is installed and the battery is connected, the ripple counter uses the initial position of the motors as the “Zero Position”. Any movement from this point is counted as “+” or “-” pulses as the motors move in either direction. The pulse position of the motors is stored in the seat module, in an EEPROM, before the ZKE goes into its “Sleep Mode”.

This prevents the position recognition from being lost. If the battery is disconnected before the 16 minute sleep mode activation, the memory positions of the seat will be lost and reprogramming will be required.

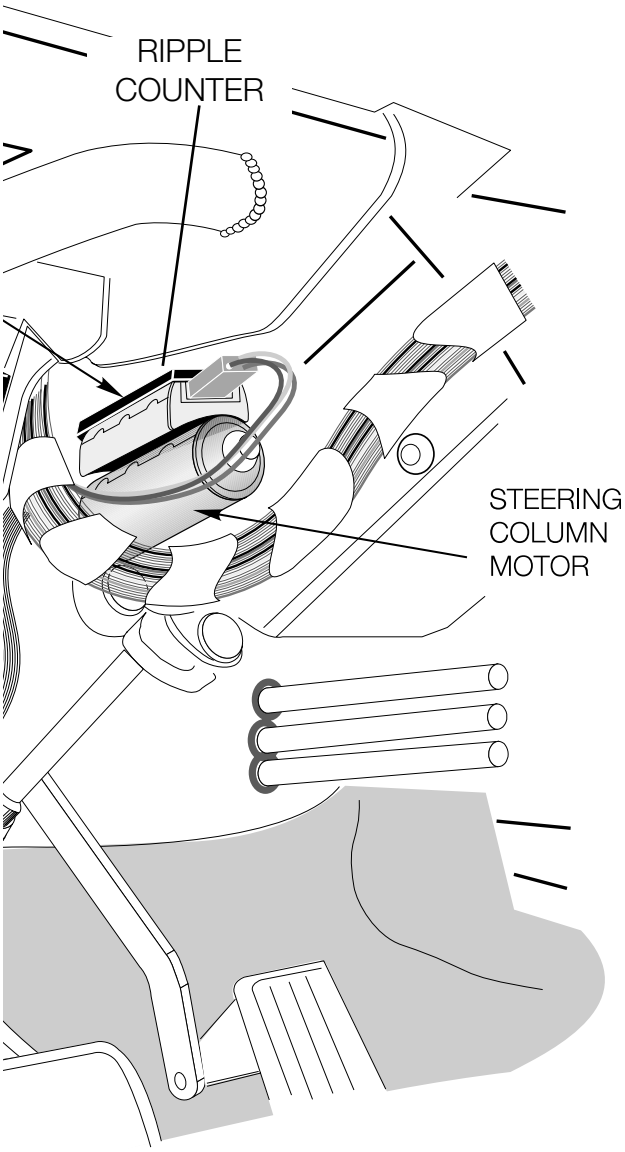

MEMORY
SWITCH
GM III
KL 31
P-BUS
DRIVER'S
DOOR
SWITCHBLOCK
MODULE
(PM-FT/SB)
STEERING COLUMN ADJUSTMENT SWITCH
COLUMN
TILT
KL 30
KL 31
M
P-BUS
KL 30
KL 31
COLUMN
LENGTH
PM-SM
FORWARD
& BACK
UP & DOWN
SEAT BASE
TILT ANGLE
BACKREST
ANGLE
HEADREST
UP & DOWN

STEERING COLUMN OPERATION



The adjustable steering column is similar to the E38 in components, mechanical linkages and electrical operation. The steering column adjusting switch is mounted on the left side of the steering column and provides for four directions of column movement.

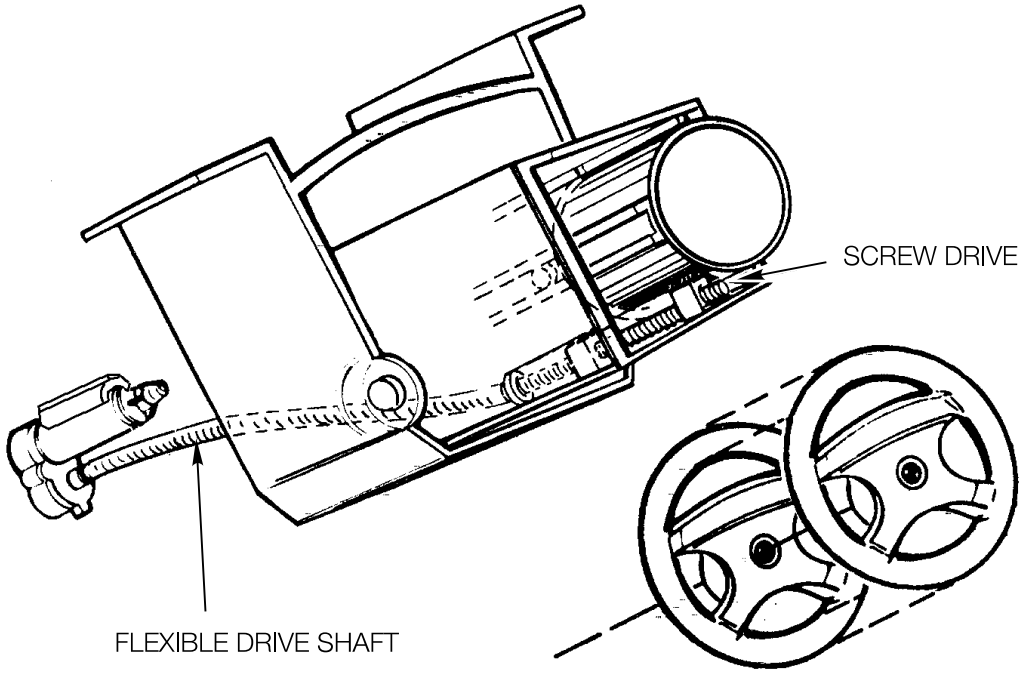
The motors for tilt and length also employ ripple counter modules for motor control and memory recall. The control electronics for the steering column are integrated into the seat module. The steering column switch inputs are processed by the seat module and the output signals are sent to the steering column ripple counter modules for motor activation.



STEERING COLUMN MOTOR DRIVES

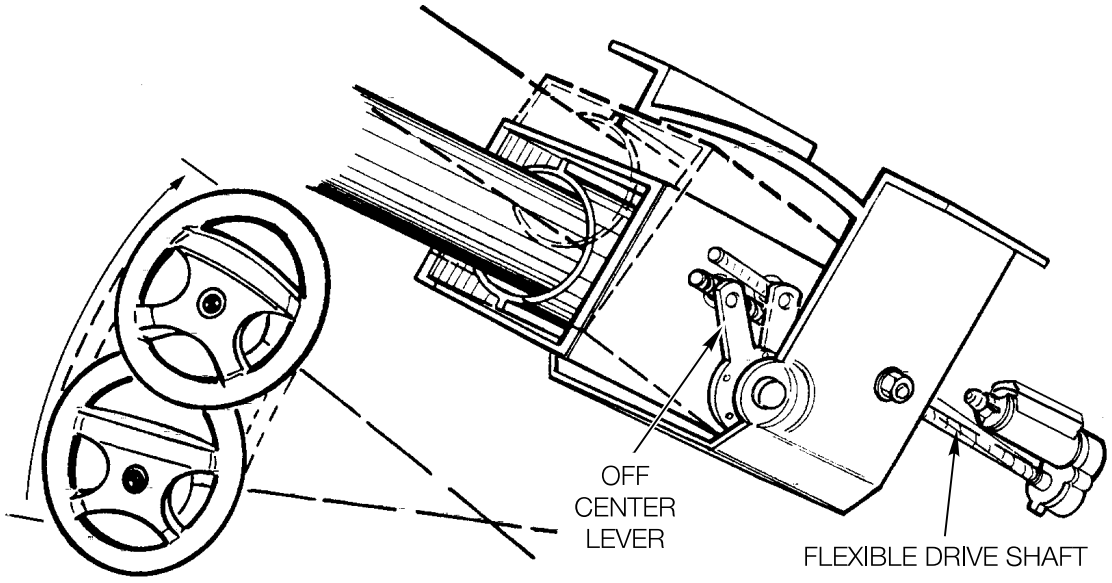
Forward/Back (Telescope)

A flexible drive shaft operates a screw drive which causes a forward/back movement of the steering column.



Up/Down

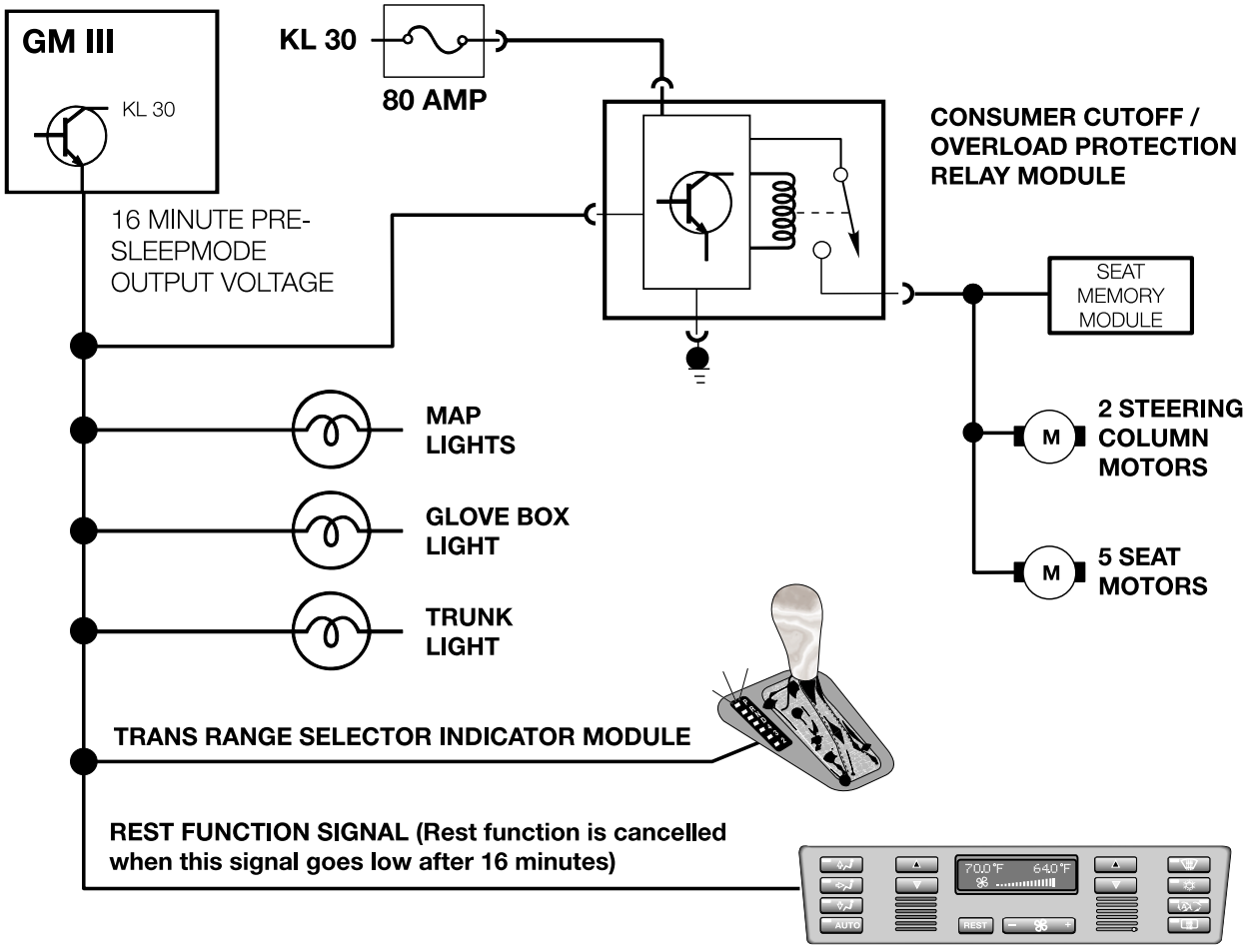
A flexible drive shaft moves an off-center lever causing up/down steering movement.



GENERAL FUNCTIONS OF ZKE III

CONSUMER CUT OFF

The interior lights are connected to the consumer cut out circuit. These consumers are connected to KL 30 and can remain on if one of the control switches are left on. This would prevent the ZKE from going into the sleep mode. However, the consumer cut off will switch Kl 30, to the interior lighting, off after 16 minutes.



OVERLOAD PROTECTION

The seat and steering column motors are provided operating power through the consumer cutoff / overload protection relay module as on the E38. The consumer cutoff signal from the GM signals the relay to maintain operating power to the consumers.

If an overload condition exists, the relay module detects the increase in amperage and opens the relay. The relay module is located in the electrical carrier forward of the glove box.

SLEEP MODE

To lower the constant battery draw when the vehicle is parked, The complete ZKE system will go into the "Sleep Mode" 16 minutes after the ignition has been switched off and no further ZKE function is active.

Approximate X5 Battery draw:

- Ignition switch off = approx 750 mA.
- One minute after = approx. 560 mA.
- After 16 minutes (sleep mode) = approx. 18 mA.

All modules in the ZKE system will go into the sleep mode. The P-Bus remains active, however no data transfer takes place until a wake-up request is received. The general module, door modules or keyless remote module can wake the system up and put the ZKE back on line. The K-Bus is not active in the sleep mode, however the GM III of Remote Entry Module can put the K-Bus back on-line with a wake-up request.

SLEEP MODE CRITERIA: KL R, 15 OFF and no further function activated for 16 minutes.

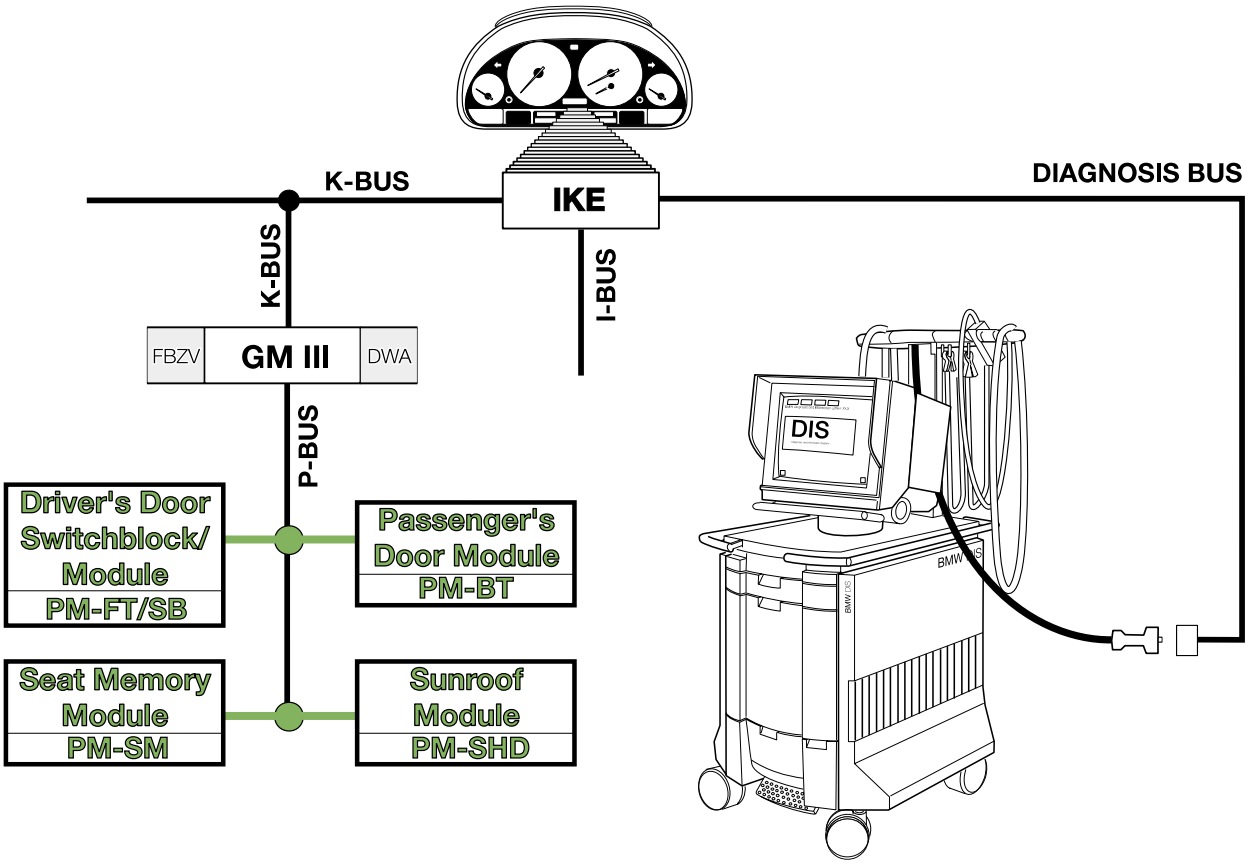
WAKE UP CRITERIA: KL R or 15 "ON" or a change in one of the signal states listed below.

SIGNAL	ACTIVITY	ORIGINATING MODULE
K-BUS	High	General Module
Door jamb switches (possibility of 4)	Low	"
Tailgate lock cylinder microswitch	High	"
Tailgate pushbutton microswitch	Low	"
Interior Tailgate pushbutton microswitch	Low	"
Central locking button	Low	"
Hood microswitch	Low	"
Tailgate microswitch	Low	"
Interior light switch	Low	"
UIS sensor	Low	"
Tilt Alarm sensor	Low	"
FBZV operational signal	High	FBZV Module
Driver's door lock microswitch - (lock)	High	PM-FT/SB
" " " " - (unlock)	High	"
Passenger door lock microswitch - (lock)	High	PM-BT
" " " " - (unlock)	High	"

DIAGNOSIS/TROUBLESHOOTING

The GM III contains an EEPROM fault memory. Faults that occur with any of the sub-systems of the ZKE are stored in the GM III. Diagnosis and troubleshooting is carried out with the DIS tester. The diagnostic link is through the IKE or Instrument cluster over the K bus to the GM.

Additional sub-fault memories are incorporated in all of the peripheral modules. The information stored in these location is used to pin point defective components.



BASIC TROUBLESHOOTING

- Always personally verify the customer complaint.
- Always verify that the complaint is truly a system malfunction.
- Perform a Quick Test to determine if the vehicle systems have logged fault codes.
- Call up the faulted system or appropriate test schedule to verify the correct control module is installed in the car.
- Follow the Diagnostic Information System (DIS) on screen instructions and perform all tests as specified.
- Use the DIS and fault symptom diagnostic procedures as trained.
- Follow the appropriate test module procedures for systems that malfunction but fail to set faults in memory.
- System problems which elude diagnostic procedures must be brought to the attention of BMW of North America, Inc.
- **BMW Technical Assistance Hotline 1-800-472-7222**